NOVA SCOTIA

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MEMORANDUM

To: All Holders of the Nova Scotia Transportation and Public Works Standard Specification, Highway Construction and Maintenance

From: Tom Gouthro, P.Eng.
Standard Specification Steering Committee Chair

Date: February 1, 2002

Subject: **February 2002 Specification Revisions**

The Department of Transportation and Public Works has completed an annual Standard Specification review. The enclosed package includes revisions effective February 2002. Revisions are denoted with a "☞" symbol in the margin.

Sections that had previously been revised have been reprinted (without the revision symbol) and included with this package.

Two Sections, dated February 1, 1997, Division 4 Section 9, GRADED AGGREGATE SEAL (TWO COURSES) and Division 4 Section 10, GRADED AGGREGATE SEAL (ONE COURSE) have been combined with Division 4 Section 12, SEAL COAT (EPWS). Division 4 Section 9 and Division 4 Section 10 should be discarded.

Please update your Standard Specification accordingly.

Yours truly,

Tom Gouthro, P.Eng.
Manager Technical Services

enclosure

Enquiries...

Seven Standard Specification review teams have been formed with the mandate of reviewing and revising existing Standard Specifications and developing new ones:

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General Requirements and Covenants	Greg Vail	860-1513	861-4828	vailgr@gov.ns.ca
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Miscellaneous	Paul Kundzins	424-4336	424-0570	kundzipa@gov.ns.ca
Environmental Protection	Denis Rushton	424-4082	424-7544	rushtode@gov.ns.ca

Any questions regarding the **review process** and **content** or **revisions** of the Standard Specifications can be directed to any one of the team leaders.

Any questions regarding interpretation of the Standard Specifications for a particular contract should be directed to the Engineer in charge of administering the contract.

The Standard Specification is available for purchase through Service Nova Scotia and Municipal Relations, Halifax, N.S. For information or to place an order contact:

- **Internet or e-mail:** www.gov.ns.ca (select link to Government Publications) or publications@gov.ns.ca
- **Mail:** P.O. Box 637, Halifax, Nova Scotia B3J 2T3
- **Telephone:** (902) 424-7580 or toll free within Nova Scotia 1-800-526-6575
- **Fax:** (902) 424-5599

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TABLE OF CONTENTS

Enquiries I
Revisions: Book Holder's Responsibility to Acquire Revisions II
Record of Revisions III
Table of Contents i

DIVISION 1 - GENERAL REQUIREMENTS AND COVENANTS

SECTION		PAGE
1	Definition of Terms	1-1-1 Rev 2000
2	Instructions to Bidders	1-2-1
	1.0 Contents of Tender	1-2-1
	2.0 Interpretation of Approximate Estimate of Quantities	1-2-1
	3.0 Examination of Plans, Specifications, and Site of the Work	1-2-1
	4.0 Preparation of Tender	1-2-1
	5.0 Post Bid Submissions	1-2-1 Rev 2000
	6.0 Taxes	1-2-1 Rev 1998
	7.0 Receiving Tenders	1-2-2
	8.0 Rejection of Tender	1-2-2
	9.0 Security	1-2-2
	10.0 Delivery of Tender	1-2-2
	11.0 Modification of Tender	1-2-2
	12.0 Withdrawal of Tender	1-2-2
	13.0 Disqualification of Tender	1-2-2
	14.0 Competency of Bidders	1-2-3
	15.0 Material Guaranty	1-2-3
	16.0 Value Engineering Alternate (VEA)	1-2-3
	17.0 Procedures for Tender Openings and Evaluations	1-2-3 Rev 2001
3	Agreement	1-3-1
	1.0 General Covenant	1-3-1
	2.0 No Implied Contract	1-3-1
	3.0 How Party of First Part is Read	1-3-1
	4.0 Construction of Clause as Covenants	1-3-1
	5.0 Performance by Contractor	1-3-1
	6.0 Security Deposit	1-3-1 Rev 2000
	7.0 Minister Covenants to Pay	1-3-2
	8.0 Final Payment	1-3-2
	9.0 No Waiver	1-3-2
	10.0 Incorporation in Contract	1-3-2
	11.0 Worker's Compensation	1-3-2
	12.0 Certificate of Recognition	1-3-3 Rev 2000
	13.0 Employment of Contractor and Workmen	1-3-3 Rev 2001
4	General Provisions	1-4-1
	1.0 Investigation of Every Condition of Work	1-4-1
	2.0 Intent of Plans and Specifications	1-4-1
	3.0 What Items in Contract Include	1-4-1
	4.0 Time of Commencement	1-4-1
	5.0 Time of Completion	1-4-1
	6.0 Extension of Time	1-4-1 Rev 1999
	7.0 Changes in Contract	1-4-2
	8.0 Unforseen Work	1-4-2

DIVISION 1 - GENERAL REQUIREMENTS AND COVENANTS (Continued)

SECTION		PAGE
4	General Provisions (Continued)	
	9.0 Additional Work	1-4-3
	10.0 Work not in Contract	1-4-3
	11.0 Inspection General	1-4-3
	12.0 Work under Control of Engineer	1-4-3
	13.0 Engineer's Decision Final	1-4-3
	14.0 Quality of Work and Material	1-4-4
	15.0 Defective Work and Material	1-4-4
	16.0 Materials Furnished by the Department	1-4-4
	17.0 Lines and Grades	1-4-4
	18.0 Contractor's Personal Attention	1-4-4
	19.0 Refusal of Contractor to do Work	1-4-4
	20.0 Power to Employ Additional Resources	1-4-5 Rev 1999
	21.0 Subletting or Assigning of Contract	1-4-5 Rev 2000
	22.0 Delays Beyond Time Limit	1-4-6
	23.0 Contractor Liable for Risks	1-4-6
	24.0 Contractor Liable for Damages	1-4-6
	25.0 Gravel Removal From Rivers	1-4-6
	26.0 Claims Against Contractor	1-4-6 Rev 1999
	27.0 Claims of Contractor	1-4-7
	28.0 Sanitary Provisions	1-4-7
	29.0 Character of Workmen and Equipment	1-4-7
	30.0 Records of Contractor Open for Inspection	1-4-7
	31.0 Notice to Contractor	1-4-7
	32.0 Cleaning of Premises	1-4-7
	33.0 Fire Protection	1-4-8
	34.0 Accommodating Traffic and Traffic Control	1-4-8 Rev 2002
	35.0 Designated Highways	1-4-9
	36.0 Registered Weight and Axle Weight	1-4-9
	37.0 Weighing Procedures	1-4-9 Rev 1999
	38.0 Truck Weigh Scale	1-4-10 Rev 2002
	39.0 Condition of Roads Immaterial	1-4-12
	40.0 Patented Devices, Materials, and Processes	1-4-12
	41.0 Borrow, Gravel, and Plant Mix Aggregate, Pit and Plant Sites	1-4-12
	42.0 Land Acquisition	1-4-13
	43.0 Payments	1-4-13
	44.0 Annulment of Contract	1-4-13
	45.0 Occupational Health and Safety Act	1-4-14
	46.0 Blasting	1-4-14
	47.0 Regulations and Guidelines Contained in Appendix B	1-4-15
	48.0 Default or Removal of Work from the Contractor	1-4-16 New 2002
	49.0 Defects and Omissions	1-4-16 New 2002
5	Environmental Protection	1-5-1
	1.0 Environmental Protection	1-5-1
	2.0 Pollution Control	1-5-1
	3.0 Borrow and Gravel Pits	1-5-1
	4.0 Mineralized Rock Excavation	1-5-1
	5.0 Disposal of Brush, Slash or Non-Merchantable Timber	1-5-1
	6.0 Work Progression Schedule	1-5-2

DIVISION 2 - EARTHWORKS

SECTION		PAGE
1	Clearing	2-1-1
2	Grubbing	2-2-1 Rev 2000
3	Roadway and Drainage Excavation	2-3-1 Rev 2002
4	Disposal of Surplus Materials	2-4-1 Rev 1998
5	Borrow	2-5-1 Rev 2000
6	Subgrade	2-6-1 Rev 1998
7	Shoulders	2-7-1 Rev 1999
8	Compaction	2-8-1 Rev 2002
9	Water for Compaction and Dust Control	2-9-1 Rev 1999
10	Rough Grading	2-10-1 Rev 1999
11	Fine Grading	2-11-1 Rev 1999
12	Foundation Excavation	2-12-1 Rev 2002
13	Foundation Excavation For Bridges	2-13-1 Rev 1998

DIVISION 3 - GRANULAR MATERIALS

SECTION		PAGE
1	Gravel Borrow	3-1-1
2	Gravel Type 1, 1S, 2 & M	3-2-1 Rev 2001
3	Iron Blast Furnace Slag	3-3-1
4	Clear Stone	3-4-1 Rev 1998
5	Compaction of Gravels	3-5-1
6	Loose Laid Rip Rap	3-6-1
7	Hand Laid Rip Rap	3-7-1
8	Armour Rock	3-8-1
9	Rock Fill	3-9-1
10	Fill Against Structure	3-10-1 Rev 1998
11	Unshrinkable Backfill	3-11-1

DIVISION 4 - PAVEMENTS

SECTION		PAGE
1	Emulsified Asphalt	4-1-1 Rev 2002
2	Performance Graded Asphalt Binder (PGAB)	4-2-1 Rev 2001
3	Asphalt Concrete Curbs & Gutters	4-3-1 Rev 2002
4	Asphalt Concrete Hot Mixed - Hot Placed	4-4-1 Rev 2002
5	Liquid Asphalt Primer	4-5-1
6	Removal of Asphalt Concrete	4-6-1
7	Asphalt Concrete Patching	4-7-1 Rev 2001
8	Asphalt Concrete Paving of Bridge Decks	4-8-1
9	Graded Aggregate Seal(Two Courses)	4-9-1 Deleted 2002
10	Graded Aggregate Seal(One Course)	4-10-1 Deleted 2002
11	Crack Filling and Crack Sealing - (EPWS)	4-11-1
12	Seal Coat - (EPWS)	4-12-1 Rev 2002
13	Reclaimed Asphalt Concrete	4-13-1
14	Sand Seal Surface Treatment	4-14-1
15	Cold Mix For Winter Patching	4-15-1 Rev 2000
16	Micro-surfacing - (EPWS)	4-16-1 Rev 2001
17	Concrete Pavement	4-17-1
18	Roller Compacted Concrete - (WS)	4-18-1 New 1998
19	Asphalt Concrete End Product Specification (EPS)	4-19-1 New 2002

DIVISION 5 - STRUCTURES

SECTION		PAGE
1	Piles	5-1-1
2	Timber Structures	5-2-1
3	Structural Steel	5-3-1
4	Miscellaneous Metal	5-4-1
5	Reinforcing Steel	5-5-1 Rev 1998
6	Steel Guard Rail Systems and Wooden Guide Posts	5-6-1
7	Cast In Place Concrete	5-7-1 Rev 2002
8	Precast Prestressed Concrete Girders	5-8-1
9	Waterproofing Concrete Bridge Decks	5-9-1
10	Structural Plate Pipe	5-10-1
11	Aluminum Guard Rail	5-11-1
12	Underground Drainage Systems	5-12-1 Rev 2002
13	Concrete Restoration	5-13-1 Rev 2000
14	Inextensible Mechanically Stabilized Earth Structures - (WS)	5-14-1 Rev 2002
15	Asphaltic Plug Joints	5-15-1 New 2000

DIVISION 6 - MISCELLANEOUS

SECTION		PAGE
1	Traffic Control Persons	6-1-1
2	Flashing Light Units	6-2-1
3	Chain Link Fence	6-3-1
4	Right-Of-Way-Fence	6-4-1
5	Removal of Existing Sidewalks, Driveways and Curbs	6-5-1
6	Non-Coning Traffic Paint	6-6-1
7	Calcium Chloride Water Solution	6-7-1
8	Calcium Chloride	6-8-1
9	Sodium Chloride	6-9-1
10	Winter Sand	6-10-1 Rev 1999
11	Magnesium Chloride	6-11-1 New 2002

DIVISION 7 - ENVIRONMENTAL PROTECTION

SECTION		PAGE
1	Sediment Barriers	7-1-1
2	Flow Checks	7-2-1 Rev 2000
3	Settlement Ponds	7-3-1 Rev 2000
4	Maintenance and Sediment Control	7-4-1
5	Hydroseeding	7-5-1 Rev 2000
6	Mulching	7-6-1
7	Erosion Control Blankets	7-7-1 Rev 2000
8	Topsoil	7-8-1 Rev 2002
9	Water Control For Bridge Foundations	7-9-1
10	Turbidity Curtain	7-10-1 Rev 2000
11	Water Control at Culvert Extensions or Installations	7-11-1
12	Dewatering With Filter Bags	7-12-1
13	Sodding	7-13-1
14	Lime	7-14-1 New 2000

DIVISION 8 - STANDARD DRAWINGS

DRAWING		PAGE
HS201.DWG	Standard Cross Section - Swamp Treatment Under Fills	8-1 Rev 1999
HS202.DWG	Standard Cross Section - Swamp Treatment Under Fills, Narrow and Wide Medians	8-2 Rev 1999
HS401.DWG	Paving Approach to Bridges	8-3 Rev 2001
HS404.DWG	Transverse Key Joint	8-4
HS402.DWG	Asphalt Concrete Curb	8-5
HS403.DWG	Asphalt Concrete Gutter	8-6
HS503.DWG	Semi - Mountable Curb and Gutter	8-7
HS504.DWG	Concrete Curb Detail Sheet 1	8-8
HS505.DWG	Concrete Curb Detail Sheet 2	8-9
HS506.DWG	Bedding Details For Laying Pipe	8-10
HS501.DWG	Sidewalk Details	8-11
HS502.DWG	Sidewalk Details	8-12
HS203.DWG	Foundation Excavation for Structures Requiring Cast in Place Concrete	8-13 Rev 2001
HS507.DWG	Typical 600 or 760 mm Diameter Catch Basin	8-14
HS508.DWG	Typical 900 mm Diameter Catch Basin	8-15
HS509.DWG	Typical 900 mm Diameter Catch Basin	8-16
HS510.DWG	Typical 1050 mm Diameter Catch Basin	8-17
HS511.DWG	Typical 1200 to 2400 mm Diameter Catch Basin	8-18
HS512.DWG	R361 and R371 Grating	8-19
HS513.DWG	S 401 Frame and Gate	8-20
HS514.DWG	S 361 Catch Basin Assembly	8-21
HS515.DWG	Cast In Place Catch Basin	8-22
HS516.DWG	Catch Basin for Median	8-23
HS517.DWG	Pipe Grates	8-24
HS528.DWG	Foundation Excavation Limits for Pre-Cast Structures	8-25 Rev 2001
HS518.DWG	Guard Rail and Post Details	8-26 Rev 1998
HS519.DWG	Guard Rail Post Details	8-27 Rev 1998
HS520.DWG	Steel Beam Guard Rail Installation Detail - Single Rail End Treatment	8-28
HS521.DWG	Guard Rail Layout at Bridge Approach	8-29 Rev 1998
HS522.DWG	Michigan Shoe Details	8-30
HS523.DWG	Guard Rail Channel Detail	8-31
HS524.DWG	Guard Rail Protection of Bridge Piers	8-32
HS525.DWG	Guard Rail Anchor Base on Concrete	8-33
HS526.DWG	Guard Rail Protection of Sign Truss Structures	8-34
HS527.DWG	Guard Rail Protection of Highway Signs	8-35
HS529.DWG	Jersey Barrier	8-36
HS601.DWG	Right-of-Way Wire Fence	8-37
HS602.DWG	Chain Link Security Fence	8-38
HS603.DWG	Chain Link Fence for Roadway Installations	8-39
HS604.DWG	Installation of Barbed Wire	8-40
HS701.DWG	Straw Base Barrier	8-41
HS702.DWG	Sediment Control Fence	8-42
HS703.DWG	Berm Barrier	8-43
HS704.DWG	Sandbag Barrier	8-44
HS705.DWG	Straw Bale Flow Checks	8-45 Rev 2000
HS706.DWG	Sandbag Flow Checks	8-46 Rev 2000
HS707.DWG	Rock Flow Checks	8-47 Rev 2000
HS708.DWG	Settlement Ponds	8-48 Rev 2000
HS709.DWG	Turbidity Curtain - Seam Detail	8-49 Rev 2000
HS710.DWG	Turbidity Curtain	8-50 Rev 2000

APPENDIX A - FORMS

FORM	PAGE
Tender Form	A-1 Rev 2002
Acknowledgement of Tender Content	A-28 Rev 2002
Release of Security Deposit Form	A-31
Statement of Asphalt Cement - Liquid Asphalt Primer & Emulsified Asphalt	A-32
Release From All Liabilities	A-33
Engineer's Certificate of Final Estimate	A-35 Rev 2000
Modification of Tender	A-36
Construction Safety Certification certificate	A-37
Certificate of Recognition Program	A-39

APPENDIX B - GUIDELINES AND REGULATIONS

DOCUMENT	PAGE
Asphalt Plant Guidelines(1981)	B-1
Pit and Quarry Guidelines(1999)	B-7 Rev 2001
Watercourse Alterations Specifications(1993)	B-15 Rev 2000

APPENDIX C - STANDARD RATES

ITEM	PAGE
Overhaul Rates	C-1 Rev 2000
Gravel in Stockpile	C-1
Pilot Vehicle	C-1
Cold Weather Concrete	C-1
Cubic Metre Kilometre Rates	C-2 Rev 2001
Tonne Kilometre Rates - Gravel	C-3 Rev 2001
Tonne Kilometre Rates - Asphalt	C-4 New 2001
Hourly Rate	C-5 Rev 2001
Truck Rates - Service Trucks	C-5 New 2001

APPENDIX D - VALUE ENGINEERING ALTERNATE (VEA)

APPENDIX E - GLOSSARY OF TERMS

APPENDIX F - SMOOTHNESS TESTING & REMEDIAL MEASURES New 2001

SECTION 2 - INSTRUCTIONS TO BIDDERS

1.0 CONTENTS OF TENDER. The Bidder will be furnished by the Department with a Tender Form (See Appendix A) which will state the location and direction of the work to be constructed, and which will show the approximate estimate of the various quantities of the work to be performed and materials to be furnished. The time frame and date on which the work must be completed shall also be provided. All papers bound with or attached to the Tender Forms are a necessary part thereof and must not be detached.

2.0 INTERPRETATION OF APPROXIMATE ESTIMATE OF QUANTITIES. The Bidder's attention is called to the fact that the estimate of the quantities of work to be done and materials to be furnished under these specifications as shown on the Tender Form is approximate, and is given only as a basis of calculation upon which the award of the Contract is to be made. The Department does not assume any responsibility that the quantities shall obtain strictly in the work nor shall the Contractor plead misunderstanding or deception because of such estimate of quantities or of the character, location or other conditions pertaining thereto. The Department reserves the right to increase, decrease or omit all or any of the quantities of work shown in the Tender Form, if the Department may deem it necessary.

3.0 EXAMINATION OF PLANS, SPECIFICATIONS, AND SITE OF THE WORK. Bidders shall carefully examine the Instructions to Bidders, Plans, Specifications, Special Provisions and site of the Proposed Work in order to satisfy themselves by examination as to all local conditions affecting the Contract and as to the detailed requirements of construction.

4.0 PREPARATION OF TENDER

4.1 Tender Forms. The Bidder must submit his Tender on the forms furnished by the Department. The blank spaces in the Tender Forms must be filled in correctly, where indicated, for each and every item for which a quantity is given, and the Bidder must state the prices (both in words and numerals) for which he proposes to do each item of the work contemplated.

4.2 Addendums. Bidders must acknowledge, as part of their tender, all addendums issued during the bidding period by the Department covering additions, corrections or changes in the bidding conditions for the advertised work. The bidder shall make all revisions to the Tender Documents as instructed in the aforementioned addendum.

It is not necessary to return the Special Provisions or Addendums, however, the tender submission shall include a properly completed and signed "Tender Signature Form", whereby Bidders acknowledge receipt, understanding and agreement with the Special Provisions and Addendum(s). A blank copy of this form will be provided with the tender package.

When an addendum is issued, the closing time shall, where necessary, be adjusted to reasonably allow bidders to receive the addendum and adequately consider, prepare and submit their bids, taking into account the impact of the addendum.

4.3 Additional Documents. Where instructed in these specifications, the Bidder shall submit any and all additional certificates, supplements, letters, plans and other information with their Tender Submission. They shall be attached to the Tender Forms and signed as directed.

5.0 POST BID SUBMISSIONS. To be eligible to be awarded any Department highway construction or maintenance contract to which these specifications apply, the bidder must provide within forty-eight (48) hours of request the following submissions: a Certificate of Recognition or Letter of Good Standing issued jointly by the Nova Scotia Department of Labour and an occupational health and safety organization approved by the Nova Scotia Department of Labour (such as the Nova Scotia Construction Safety Association), or a valid Letter of Good Standing from an occupational health and safety organization approved by the Nova Scotia Department of Transportation and Public Works indicating that the Contractor is in the process of qualifying for the Certificate of Recognition. An example of this letter is included in Appendix 'A' of these specifications.

The bidder must provide within forty-eight (48) hours of request, evidence of an account with the Workers' Compensation Board, coverage under the Workers' Compensation Act, revised statutes of Nova Scotia and a Clearance Certificate indicating that the bidder is in good standing.

6.0 TAXES

6.1 Harmonized Sales Tax. The Province is not exempt for Harmonized Sales Tax (HST) purposes. As a result, the aggregate amount of tender for Department contracts is subject to HST, however, prices submitted shall not include HST.

The HST payable by the Department will be added as a separate item during Department processing of progress payments and, therefore, HST will not appear as a cost in the aggregate amount of tender.

Bidders are advised that they are eligible to claim an Input Tax Credit (ITC) for a portion of the HST paid in relation to the contract to the requirements of the Government of Canada.

7.0 RECEIVING TENDERS. As instructed by Public Tender Office.

8.0 REJECTION OF TENDER. Tenders will be rejected if they show any omissions, alterations of forms, additions not called for, conditional or alternate bids, or irregularities of any kind or if they contain a clause in which the Bidders reserves the right to accept or reject a Contract awarded to him. Tenders in which the prices are obviously unbalanced may be rejected. The right to reject any or all Tenders is reserved by the Minister and the lowest or any Tender will not of necessity be accepted.

9.0 SECURITY. Tenders will be rejected unless accompanied by a security deposit of a specified amount. This deposit shall consist of a Certified Cheque, Irrevocable Standby Letter of Credit, Bank Draft or Money Order in a form satisfactory to the Department for a specified amount made payable to the Department of Transportation and Public Works, Province of Nova Scotia, drawn upon a Canadian Chartered Bank and marked accepted by the financial institution upon which it is drawn. It will be forfeited to the Department, if the Bidder neglects or refuses to enter into a Contract when called upon to do so, or if, after entering into a Contract, he fails to proceed with and complete the work satisfactorily, according to the terms of the Contract. In the event of the Tender not being accepted the Certified Cheque, Irrevocable Standby Letter of Credit, Bank Draft or Money Order will be returned to the Bidder.

10.0 DELIVERY OF TENDER. As instructed by Public Tender Office.

11.0 MODIFICATION OF TENDER. If the Contractor wishes to make a change(s) to their bid, these changes must be received by the Public Tender Office prior to the posted closing time, subject to its acceptance. All changes must be shown on the Form entitled "Modification of Tender". A sample form is shown in Appendix "A" of these Standard Specifications. The change(s) must state the Tender Number, Project Number, followed by the Item Number(s) and Description(s). The difference in the change of the unit price for all Items must also be shown. All changes in unit prices must be written in ink, both in words and numerals.

12.0 WITHDRAWAL OF TENDER. A Bidder will be permitted to withdraw his Tender unopened after it has been deposited if such request is received in writing prior to the bid closing time.

13.0 DISQUALIFICATION OF TENDER. More than one tender from an individual firm, partnership, corporation or association under the same or different names will not be considered. Collusion between Bidders will be sufficient cause for the Rejection of all bids so affected.

14.0 COMPETENCY OF BIDDERS. The bidder must be capable of performing the various items of work bid upon. They may be required to furnish to the Department a statement covering experience on similar work, lists of machinery, plant, and other equipment available for the proposed work and such statements of their financial resources as may be deemed necessary.

15.0 MATERIAL GUARANTY. Before any Contract is awarded the Bidder may be required to furnish a complete statement of the origin, composition and manufacture of any or all materials to be used in the construction of the work included in the Contract together with samples, which samples may be subjected to any and all tests required by the Department to determine their quality and fitness for the work.

16.0 VALUE ENGINEERING ALTERNATE (VEA). A Value Engineering Alternate will be entertained on selected Department contracts. Such contracts will be noted in the Special Provisions of said contract.

A VEA will not be considered when awarding the Tender. Award of the Tender will be based solely on the original Tender proposal and design. The VEA may be accepted or rejected by the Department at its sole discretion. The proposing of any design does not place the Department under any obligation to accept the design. Net construction savings will be shared equally between the Contractor and the Department. Minimum overall savings will be identified, confirmed and fixed prior to the Department giving approval to a VEA. All other terms and conditions will be as specified in the Department's VEA policy contained in Appendix 'D' of these specifications.

17.0 PROCEDURES FOR TENDER OPENINGS AND EVALUATIONS

17.1 Tender Opening. A preliminary check will be conducted at the tender opening to ensure the following information has been included.

• **Security Deposit.** Each tender is reviewed to ensure that a security deposit accompanies the tender.

• **Aggregate Amount.** Each tender is reviewed to ensure the total aggregate tender amount has been included.

Failure to meet these requirements may result in rejection of the tender at the tender opening stage.

17.2 Tender Evaluations. All tenders not rejected at the tender opening will be subject to a detailed evaluation by Department staff before a recommendation is made for award of tender. This detailed review will take place as soon as possible after the public opening and will consist of the following:

• **Tender Form.** The tender must be submitted on the proper form, supplied by the Department.

Unit prices must be written in ink or typewritten and must be given in both words and numerals in the appropriate columns.

Forms may not be altered, unless called for in a Department Addendum.

• **Bid Conditions.** The Bidder is not permitted to include conditions with their tender.

• **Security Deposit.** A security deposit, meeting the requirements of Division 1, Section 2, Subsection 9.0, must be included with the tender.

• **Signatures/Acknowledgements.** The "Tender Signature Form" must be completed and signed as an acknowledgement of the receipt and understanding of the documents (including Special Provisions and Addendums where applicable).

• **Arithmetic Checks.** The tender will be checked for arithmetic errors. In cases where the written unit price does not agree with the numeric price, the written unit price will be used. All mathematical errors will be corrected by Department staff and the rating of tenders as to total bid will be based on the corrected totals.

Failure to meet the requirements of the above items will result in the rejection of the tender.

• **Unbalanced Bids.** Tenders will be reviewed to identify instances of unbalanced bidding. Tenders containing bid prices which are obviously unbalanced, may be considered for rejection.

SECTION 3 - AGREEMENT

THIS AGREEMENT made this..... day of.....

in the year Two Thousand and.....by and between

.....

.....

herein called the **CONTRACTOR**, the Party of the First Part, and **HER MAJESTY THE QUEEN**, in the right of Her Province of Nova Scotia as represented in this behalf by the **HONOURABLE MINISTER OF TRANSPORTATION and PUBLIC WORKS** of the Province of Nova Scotia herein called the **MINISTER**, the Party of the Second Part.

WITNESSETH, AS FOLLOWS:

1.0 GENERAL COVENANT. The Contractor hereby covenants and agrees with the Minister as herein provided in connection with the following work, namely:

2.0 NO IMPLIED CONTRACT. It is hereby understood and agreed between the Parties hereto that no implied contract of any kind whatsoever, by or on behalf of the Minister, shall arise or be implied from anything contained in this Contract, or from any position or situation of the Parties at any time. It is further agreed that this Contract made by the Minister is and shall be the only Contract, upon which any rights against him are to be founded.

3.0 HOW PARTY OF FIRST PART IS READ. Whenever this Agreement is entered into by more than one Party or Parties of the First Part, the word "Contractor" shall be read "Contractors." All pronouns in the Contract referring to the Contractor shall be read as plural and whenever a Corporation is the Party of the First Part, the said pronouns shall be read accordingly.

4.0 CONSTRUCTION OF CLAUSE AS COVENANTS. Whenever it is stipulated in any part of the Contract that anything shall be done or performed by either of the Parties hereto, it shall have the same effect and be construed as if such Party had entered into a covenant with the other Party to do or perform the same, and as if any such covenant had been expressly made on the part of the Contractor not only on his own behalf but also on behalf of his legal representatives, Successor or Assigns; and as if any such covenant on the part of the Minister and been made on behalf of himself and his Successors in Office.

5.0 PERFORMANCE BY CONTRACTOR. All Contractors shall, at their own cost and expense, furnish and provide all and every kind of labour, superintendence, services, tools, implements, machinery, plant, materials, articles and things whatsoever necessary for the due execution and completion of the work. They shall fully construct, erect and complete the same within the time specified, in the most thorough, workmanlike and substantial manner, in every respect to the satisfaction and approval of the Engineer, and deliver the same to the Minister, all in the manner and upon the terms and conditions of the Contract.

6.0 SECURITY DEPOSIT. The Contractor hereby and herewith deposits with and delivers to the Minister a security for the due fulfilment of their contract in the sum of..... dollars ($.....) upon the express understanding that the same will be held and retained by the Minister until the Minister is satisfied that the work has been completed and all provisions of the contract have been met, (ie. Article **26.0 CLAIMS AGAINST CONTRACTOR.** of the General Provisions) and the warranty period has expired, whichever is later, as security for the due and faithful performance, observance and fulfilment by the Contractor of all the covenants, provisions, agreements, conditions and reservations in this contract contained, on the part of the Contractor to be observed, performed and complied with. Provided always and it is understood and agreed that the Contractor assumes the risk and must bear any loss in respect to the security deposited as aforesaid occasioned by the failure or insolvency of the banks on which any certified cheque or letter of credit was drawn or in which any deposit was made in connection with the security aforesaid.

The expiration date for any Irrevocable Standby Letter of Credit used as security for this contract shall be dated no earlier than ..... . If at any time during the execution of this contract, the Department determines that the completion of any portion of work included in this contract may extend beyond the expiration date, the Contractor shall provide to the Engineer, a new Letter of Credit in the amount of

..... with an expiration date dated one year beyond the original expiration date or written proof from the issuer of the original Letter of Credit that it has been extended. If a new Letter of Credit or proof of extension is not provided to the Engineer more than 10 working days prior to the present expiration date, the Department shall automatically draw the full amount of monies stated in the Letter of Credit and hold such monies until a new Letter of Credit or proof of the extension is provided to the Engineer.

If at any time hereafter the Contractor should make default under the said Contract, or if the Minister, in his sole discretion, acting under the powers reserved in the said Contract, shall determine that the said works, or any portion thereof remaining to be done, should be taken out of the hands of the Contractor, and be completed in any other manner whatsoever than by the Contractor, or if the Contractor refuses or neglects to pay any salaries or wages or any accounts for materials due by the said Contractor for work done or materials supplied by any person in connection with the said work, the Minister may, in either case, dispose of said security and of the interest which may have accrued thereon, for the carrying out of the construction and completion of the work of the Contract, or for paying any salaries or wages for work done, or any accounts for materials supplied for the said works that may be left unpaid by the said Contractor.

In the event of any breach, default, or nonperformance being made or suffered by the Contractor in respect of any of the terms of conditions, covenants, provisions, agreements, or restrictions herein contained, which on the part of the Contractor should be observed, performed or complied with, the said money, and interest thereon, so delivered to or deposited with the Minister, or by him received in respect thereof, shall, by the Contractor, be forfeited absolutely to the Minister.

Upon the due and faithful performance, observance and fulfilment by the Contractor of all the terms, provisions, covenants, agreements, conditions and reservations, herein before contained, on the part of the Contractor to be observed, performed and complied with, the Contractor shall be entitled to be repaid or to receive again the money so deposited, together with so much interest upon such money as the Minister may, during his retention or possession of the same, actually receive by reason thereof. However, it is understood that the Minister shall not be under any obligation to cause the said money to placed at interest, or to earn, or to endeavour to earn, interest thereon.

7.0 MINISTER COVENANTS TO PAY. In consideration of the faithful performance by the Contractor of all and singular the covenants, agreements and provisions of the Contract, the Minister hereby covenants and agrees with the Contractor that, on the full completion by the Contractor of all the work as specified in the contract, within the time specified and limited for the final completion thereof, and to the entire satisfaction of the Engineer, to be evidence by the certificate of the Engineer in writing, he, the said Minister, will well and truly pay or cause to be paid to the Contractor the amount of the Contract price, being the actual quantities in the several items in the schedule of Prices contained in the Tender at the unit prices or bulk sum, prices quoted by the Contractor. This amount paid to the Contractor as above shall include all and every kind of work, labour, superintendence, services, tools, implements, machinery, plant, materials, articles and things whatsoever necessary for the full execution and completion of the work to the entire satisfaction of the Engineer. In case of dispute as to what work, labour, superintendence, services, tools, implements, machinery, plant, materials, articles and things are or are now so included, the decision of the Engineer shall be final and conclusive.

8.0 FINAL PAYMENT. It is hereby agreed between the Parties hereto that the payment of the final amount due under the Contract, and the adjustment and payment of any bills that may be rendered for work done, in accordance with any alteration in or addition to the same, shall release the Minister from any and all claims or liability on account of work performed under the said Contract, or any alteration in, or addition to the same. It is further agreed that before final payment is made by the Department to the Contractor, the Contractor shall furnish the Department with a release on the Release Form attached to this Agreement and identified by the Contractor's signature thereon.

9.0 NO WAIVER. The Contractor agrees that no condoning, excusing, or overlooking by the Minister, or any person acting upon his behalf, or previous occasions, or breaches, or defaults, similar to that for which any action is taken, or power is exercised, or forfeiture is claimed or enforced against the Contractor, shall be taken as a waiver of any provision of the Contract, or as defeating, affecting, or prejudicing in any way the rights of the Minister under the Contract.

10.0 INCORPORATION IN CONTRACT. Department of Transportation and Public Works Standard Specification dated February 1, 1997, Tenders and Special Provisions contained in a list attached hereto, together with the Instructions to Bidders, Release from All Liabilities and plans are hereby made a part of and

incorporated in this agreement as fully and to the same effect as if the same had been set forth at length in the body of the agreement.

11.0 WORKER'S COMPENSATION

11.1 Letter of Good Standing. The Contractor is to provide a Letter of Good Standing from Workers' Compensation Board of Nova Scotia indicating the Contractor is assessed and is in good standing, before any contract is awarded. The Contractor shall remain so for the duration of the contract.

11.2 Letter of Clearance. Upon completion of the work, and prior to the release of the holdback, the Contractor shall provide a Letter of Clearance from Worker's Compensation Board of Nova Scotia indicating the Contractor is assessed and is in good standing.

12.0 CERTIFICATE OF RECOGNITION

12.1 Letter of Good Standing. The Contractor shall provide within forty-eight (48) hours of request, before any contract is awarded, a Certificate of Recognition issued jointly by the Nova Scotia Department of Labour and an occupational health and safety organization approved by the Nova Scotia Department of Labour (such as the Nova Scotia Construction Safety Association), or a valid Letter of Good Standing from an occupational health and safety organization approved by the Nova Scotia Department of Transportation and Public Works indicating that the Contractor is in the process of qualifying for the Certificate of Recognition. The Contractor shall remain in good standing for the duration of the contract.

The Contractor shall provide within ten (10) days after award of contract a copy, provided by each Subcontractor, of their Certificate of Recognition issued jointly by the Nova Scotia Department of Labour and an occupational health and safety organization approved by the Nova Scotia Department of Labour (such as the Nova Scotia Construction Safety Association), or a valid Letter of Good Standing from an occupational health and safety organization approved by the Nova Scotia Department of Transportation and Public Works indicating that the Contractor is in the process of qualifying for the Certificate of Recognition. The Subcontractor shall remain in good standing for the duration of the Contract. Consideration will be given to permitting the Contractor to name additional Subcontractors during the course of the contract (i.e. after the ten (10) days, following award, has expired). In such cases, said Subcontractors shall not be permitted to carry out work on the contract until such time that the Contractor has provided the above information for each Subcontractor so named.

13.0 EMPLOYMENT OF CONTRACTOR AND WORKMEN. It shall be a condition of this contract that, at the time the contract is entered into, the Contractor must be a resident of Canada or if the Contractor is a corporation, it was for a period of at least one year immediately prior to that time, incorporated and carrying on business in Canada or the owners of a majority of the shares of such a corporation were resident, for a period of at least one year prior to incorporation, in Canada. Canadian material is to be used in carrying out the work to the full extent to which it is procurable, consistent with proper economy and the expeditious carrying out of the work. Residents of Canada, only, are to be employed on the work. In employing persons there shall be no discrimination in favour of or against any person by reason of race, sex, religious views or political affiliations.

The following is the practice to be adhered to by all Contractors working on Department contracts and shall apply to materials, as noted in the following, hauled after 12:00 noon, local time, on the date of the tender closing.

The 80-20 rule shall apply to the hiring of local trucks for Department operations. At least 80% of the trucks hired on NSDOT&PW contracts must be private trucks hired, on a rotational basis, through the local branch of the Truckers Association of Nova Scotia, so that all trucks in the area receive a relatively equal amount of work. This is referred to as the 80-20 rule.

13.1 Hauling of Granular Materials and Asphalt Concrete. The 80-20 rule applies to hauling of all granular materials (including rock fill and loose laid rip rap) and asphalt concrete from a pit, crusher or asphalt plant for a Department project. Department Truck Rates to apply.

13.2 Hauling Materials To Produce Granular Materials. The 80-20 rule applies to the hauling of all material which is to be used to produce granular material including stone chips (with exception of material to be used to produce asphalt concrete). Department Truck Rates apply.

13.3 Hauling of Stone Chips For Seals. The 80-20 rule applies to the hauling of stone chips for seals from the site where the stone chips are manufactured to a stockpile location on or near the contract and also from the stockpile on or near the contract to the spreader.

Department Truck Rates apply.

13.4 Hauling of Aggregates for Micro Surfacing. The 80-20 rule applies to the hauling of aggregate for Micro Surfacing from the site where the aggregate is manufactured to a stockpile location on or near the contract. Department Truck Rates apply.

13.5 Hauling of Excavation or Borrow Material.

- *Section of Road Not Designated.* The 80-20 rule applies to the hauling of excavation and/or borrow material on a project where the section of road under contract is not designated. Department Truck Rates apply.

- *Part or All of Section of Road Designated.* The 80-20 rule applies to the hauling of excavation and/or borrow material over a non designated section of highway for a project where all or a portion of the section of road under contract is designated. Department Truck Rates apply.

13.6 Hauling of Common and/or Borrow Material. The 80-20 rule does not apply to hauling of common and/or borrow material for a project where the section of road under contract is designated, and the movement of material is confined to the designated limits. Department Truck Rates do not apply.

13.7 Hauling of Blend Sand. The 80-20 rule does not apply to the hauling of material (including blend sand) to be processed into asphalt concrete. Department Truck Rates do not apply.

13.8 One Truck Only. If only one truck is required on a contract the Contractor may use a truck of his own choice. However, to comply with the 80-20 rule, before the Contractor could use another truck of his choice he would have to have a minimum of 8 private trucks employed on the contract provided, of course, private trucks were available.

13.9 General. Granular material is deemed to include all classes of gravel, Special Gravel, Gravel Borrow, Rock Fill, Loose Laid Rip Rap and Fill Against Structure material.

Where Department rates apply, rates paid to all owners of trucks in the employ of the Contractor, Sub-contractor, or of any person doing or contemplating doing, the whole or any part of the work contemplated by the Contractor, shall be at least equal to the rates of pay fixed by the Minister from time to time. It should be noted, however, that the rate to be used when hauling items for which the Contractor is paid on a per tonne basis must be the tonne-km rate.

The rates paid to all labourers or other persons in the employ of the Contractor, Sub-contractor, or of any person doing, the whole or any part of the work for the Contractor shall be at least equal to the rates of pay that may be fixed by the Minister from time to time.

Workmen shall not be required to work longer hours than those fixed by the custom of the trade in the district where the work is carried on, except for the protection of life or property, or in case of other emergencies. In the event of a dispute arising as to wages, or what are the current hours fixed by the custom of the trade, it shall be determined by the Minister whose decision shall be final.

In the event of default being made in payment of moneys owing to any person employed on the said work and if a claim, therefore, is filed in the office of the Minister and proof thereof satisfactory to the Minister is furnished, the said Minister may pay such claim out of any moneys at any time payable by the Minister under said contract, and the amounts so paid shall be deemed payments of the Contractor.

SIGNED, SEALED AND DELIVERED

IN WITNESS WHEREOF the Parties hereto have herewith cause These Presents to be signed, and sealed, on the day and year first above written.

By the Contractor in the Presence of

.....

.....

Contractor
Witness

SIGNED, SEALED AND DELIVERED
by the Minister in the Presence of

.....

.....

Minister
Witness

SECTION 4 - GENERAL PROVISIONS

1.0 INVESTIGATION OF EVERY CONDITION OF THE WORK. The contract is made and entered into by the Contractor and the Minister on the distinct understanding that the Contractor had, before execution, investigated and satisfied himself on the character and topography of the county, its streams, water courses and rainfalls, the dimensions, levels, character and nature of all existing works, buildings, constructions, road, lands, waterways, sewers, pipes, the nature of the strata through which excavations, if any, are to be made, and all other things and of every condition affecting the works to be executed and the labour and material to be provided, and that the execution of this contract by the Contractor is founded and based upon his own examination, knowledge, information and judgement, and not upon any statement, representation or information made or given, nor upon any information derived from any quantities, dimensions, tests, specifications, plans, maps, or profiles made, given or furnished, by the Minister or Minister's representative. Any such statement, representation or information, if so made, given or furnished, was made, given or furnished merely for the general information of bidders and is not in anyway warranted or guaranteed by or on behalf of the Minister. No extra allowance will be made to the Contractor by, and the Contractor will make no claim against the Minister for any loss or damage sustained in consequence, or by reason of, any such statement, representation or information being incorrect or inaccurate, or on account of excavating in rock or other difficult ground, or of unforseen difficulties of any kind.

2.0 INTENT OF PLANS AND SPECIFICATIONS. The plans and specifications are to be taken co-jointly, each as explaining the other. The two together shall be held to cover and to be descriptive of any and all work that could reasonably be required to be done, in order to properly complete the work under this contract. Should there be any discrepancy or disagreement between the figures on the plans, and the scale of the same, or between the descriptive writings on the plans, and the specifications, the Engineer shall decide which is to be followed. Should there be anything shown on the plans but not described in the specification, or vice versa, the work shall be fully executed and carried out, just as if fully shown and described in both.

Any and all minor details of the work not specifically mentioned in the specification or shown on the plans, but obviously necessary for the full and proper completion of the work, shall be considered as incidental, and as being a part of and included in the work, to be done under the contract. The Contractor will not be entitled to any extra or additional compensation for such work. Should any dispute arise between the Engineer and Contractor as to the true meaning of the plans and specifications upon any point, the decision of the Engineer shall be final and conclusive. Whenever it is specified that the Contractor must prepare his own plans, the approval of such plans by the Engineer shall be general only and such approval will not relieve the Contractor from any responsibility whatsoever. The Contractor will not be allowed any compensation for such plans and the contract price shall include the cost of furnishing them.

3.0 WHAT ITEMS IN CONTRACT INCLUDE. The description of the work and any portion thereof and of the materials referred to by any item of which a price is given in this contract, includes not only the particular kinds of work or materials mentioned in the said item, but also all and every kind of work, labour, tools, plant, materials, equipment, articles, and things whatsoever necessary for the full execution, completion, and delivery, ready for use, of such respective portions of the works, in accordance with the plans, drawings and specifications, to the satisfaction of the Engineer.

In order to facilitate Department accounting some contracts are made up of two or more Sections as described on the Tender Forms.

If, during the conductance of a Contract which consists of more than one Section, work is authorized by the Engineer for which there is no Tender Item or Unit Bid Price then the work will be carried out by the Contractor, and payment for this work shall be made as per the Tender Unit Bid Price as shown on the Main Section of the Contract. The Main Section of the Contract either shall be designated later in these provisions or shall be determined by the District Director.

4.0 TIME OF COMMENCEMENT. The time of commencement and the rate of progress made with the work shall be such as to ensure its final completion on or before the completion date specified in the contract documents.

5.0 TIME OF COMPLETION. The whole of the work to be done under this contract shall be finally completed in full accordance with all the terms and conditions of this contract on or before the day specified for such completion in the Tender which forms part of this contract. The Contractor shall complete as quickly as it is deemed practicable any portion of the contract upon which he has undertaken work.

6.0 EXTENSION OF TIME. The Department may consider an extension to the completion date of the

contract, on the following basis:

- Federal or Provincial Laws passed subsequent to the date of the contract adversely affecting progress.
- When the Contractor is requested by the Department to perform additional work or work beyond the scope of the original tender design, the Engineer will extend the completion date by the same proportion of time as the additional work bears to the original work.
- Delay by the Department in the issuance of any plans, materials, notices or other items which in the opinion of the Engineer interfered with the Contractor's approved start date and/or work schedule.
- Any other conditions which in the opinion of the Engineer warrants consideration for an extension of time.

Failure by the Contractor, in the opinion of the Engineer, to prosecute the work continuously and in the most diligent and efficient manner possible, using every means and alternative methods available to complete the project, will be cause for denial of any such time extension.

Proceeding with the work without a Work Schedule approved by the Engineer in accordance with Clause 1.40.20.3 of these Specifications, or non compliance with said Work Schedule in the opinion of the Engineer, will be grounds for denial of any requested time extension.

No extensions for weather will be considered between April 15 and December 1 whatsoever. The Department may consider an extension or suspension of the Contract between December 1 and April 15 of the following year, if in the opinion of the Engineer, it would be in the best interest of the Department. Liquidated damages as detailed in the contract documents will not be applied for extensions granted by the District Director for the period between December 1 and April 15.

Any extension of time that may be granted to the Contractor shall be so granted and accepted without prejudice to any rights of the Minister whatsoever, under this contract, and no assent thereto on the part of the Contractor shall be necessary.

7.0 CHANGES IN CONTRACT. The Engineer shall have the right and authority at any time, either before the commencement or during the construction of the work, or any portion thereof, to make any changes in the lines or grade or in the dimensions, form, plan, location, position and quantity of the work to be done, or of any part or parts thereof, or in any other thing connected with the work, whether or not such changes increase or diminish the quantity of work to be done, or the cost of doing the same. If the changes diminish, or increase the quantity of work to be done, they shall not constitute a claim on the part of the Contractor for damages, or for any loss of anticipated profits. No changes or omissions shall in any way annul or invalidate the contract, but all additional work or changes in the work contracted for shall be considered and treated as if originally contracted for, and shall be subject to all the terms, conditions and provisions of the original contract. No deviations from the plans or specifications shall in any case be made by the Contractor without a written order signed by the Engineer, setting forth the nature and extent of the changes proposed.

8.0 UNFORESEEN WORK

8.1 Unforeseen Work. Unforeseen work, as defined in Division 1, Section 1 of these specifications, must be authorized and payment provided for by one of the two following methods:

8.1.1 Letter of Quotation. The Contractor shall submit a letter of quotation to the Department containing a unit price or prices for the additional work. The price or prices shall be approved by the Department before the commencement of work.

8.1.2 Extra Work Order. The Engineer shall issue a written Extra Work Order to the Contractor setting out the nature and extent of the extra work proposed. Compensation for the work is to be on a cost plus basis as described below. Statements of account shall be submitted on Department forms. All labour, materials, and equipment used shall be suitable to complete the work described and shall be approved by the Engineer prior to the work being done. Labour rates are to be actual labour rates paid by the Contractor to his employee. Equipment rates are not to exceed those contained in the Department's Schedule of Rental Rates for Construction Equipment. Truck rates shall be Department rates in effect at the time the work is done. Rates for equipment not contained in the Schedule of Rates shall be approved by the Engineer before the work is commenced. In cases where the Contractor does not have his own equipment available to complete the work and must hire equipment, the rate to be paid to the Contractor shall be approved by the Engineer before the equipment is hired. The actual cost of labour, materials, rented equipment and outside services, shall not exceed reasonable market value. The Contractor shall furnish the Engineer with supporting invoices for all materials, outside services and rented equipment for which the rates are not in accordance with the Department Schedule.

The Contractor will be allowed an additional 20% on the actual cost for labour, materials, outside services,

and hired equipment. This additional percent is for the use of tools, Contractor's plant (except such plant as rentals have been agreed upon) Superintendent's payroll and profit.

8.2 Refusal to do Work, Claims. In the absence of a written letter of quotation or written Extra Work Order, the Contractor will not be entitled to payment for any such unforseen work. If the Engineer and Contractor fail to agree upon the unit price quoted for the extra work, or the Contractor refuses to carry out the work as described in the Extra Work Order, the Engineer shall have the right to have the work carried out and completed by others. The Contractor shall have no claim for hindrances or delays caused by getting the unforeseen work completed.

In the case of work done under authorization of an Extra Work Order, the Contractor shall submit the necessary forms and supporting documentation to the Engineer within 60 days of the last day of the period during which work was done. The period referred to is the monthly period for which progress payment for work on the contract is normally made.

9.0 ADDITIONAL WORK

9.1 Less than 10% of Original Tender. Additional Work, as defined in Division 1, Section 1 of these specifications, less than 10% of the original tender must be authorized and payment provided for by one of the two methods outlined in Sections 8.1.1 and 8.1.2 of these General Provisions.

9.2 Greater than 10% of Original Tender. If the additional work is greater than 10% of the original tender, the additional items or work will be tendered in accordance with the Government tendering policy or an application for sole sourcing made to the Priorities and Planning Committee.

10.0 WORK NOT IN CONTRACT. The Minister may at any time without payment to the Contractor, send and employ on the work site, other contractors and workmen, with such machinery, tools, plant, equipment, materials and incidentals, as the Engineer may deem necessary to do any work not comprised in the contract. The Contractor shall afford to them all reasonable facilities to the satisfaction of the Engineer for doing such work. The work of the Contractor shall be interfered with as little as the Engineer may deem practicable. The taking of possession of the whole or any part of the work of the Contractor shall not be considered an acceptance by or on behalf of the Minister of the whole or any portion of the work comprised in the contract.

11.0 INSPECTION GENERAL. The Engineer may provide for the inspection of all materials used and work done under the contract by assistants and inspectors, acting under his direction. Such inspection may extend to, and cover all or any parts of the work and also the preparation and manufacture, whether within the limits of the work or elsewhere, of any of the materials to be used, or for the execution and final completion of the said work. Inspectors shall have full authority to reject defective materials or workmanship, and to suspend the carrying out of any work that is being improperly done, subject to the final decision of the Engineer. Inspectors shall have no authority to permit deviations from, or to relax any of the provisions of the specifications, without written permission or instruction from the Engineer, nor to delay the Contractor in any way by failure to inspect material and workmanship, with reasonable promptness, when being notified by him. All materials and workmanship, will be inspected thoroughly and carefully, and the Contractor will at all times be held strictly to the spirit of the specification. All the work must be first-class in every particular and in thorough conformity with the plans and specifications.

12.0 WORK UNDER CONTROL OF ENGINEER. The work shall, in every particular, be under and subject to the control and supervision of the Engineer. All orders, directions or instructions at any time given by the Engineer with respect, thereto, or concerning the conduct thereof, shall by the Contractor promptly and efficiently be obeyed, performed and complied with, to the satisfaction of the Engineer. All instruction and directions or certificates given, or decisions made, by anyone acting under the authority of the Engineer shall be subject to his approval, and may be cancelled, altered, modified and changed as he may see fit. In cases where the Contractor or Minister is dissatisfied with the decision of anyone acting under the authority of the Engineer, an appeal, may be made to the said Engineer, whose decision in the matter shall be final and conclusive.

13.0 ENGINEER'S DECISION FINAL. It shall be distinctly understood that the sole and every part of the work to be done under this contract is to be executed and completed in full accordance with the plans and specifications covering the work, and any further orders or directions or instructions that may be given from time to time by the Engineer in regard thereto, and to the complete satisfaction of the said Engineer, as evidenced by his written certificate, which certificate, shall be a condition precedent to the rights of the Contractor to be paid for the work; and that the said Engineer is to be the sole judge and arbitrator as to the mode and manner in which the work is to be carried out, and as to the efficiency, quality and quantity of the work done or materials furnished under the contract. The Engineer shall also decide any and all questions

that may arise as to the meaning or interpretation of the plans and specification, and every other matter and thing incident, to bearing upon or arising out of the plans, specification and contract. His judgement, decision, or award upon any and all such questions shall be absolutely final, binding and conclusive, as between the parties to the contract.

14.0 QUALITY OF WORK AND MATERIAL. All the work shall be constructed of the best materials of their several kinds, and shall be finished in the best and most workmanlike manner, in the manner required by, and in strict conformity with this contract, the plans and specification, and the working or detail drawings, which may from time to time be furnished, and to the complete satisfaction of the Engineer. The judgement and decision of the Engineer as to whether the materials supplied and the work done under the contract comply with the requirements of the plans and specification shall be final and conclusive.

15.0 DEFECTIVE WORK AND MATERIAL. No material shall be used in the work, or any portion thereof until it has been examined and approved of by the Engineer or his authorized representatives. All rejected materials must be removed from the site of the work and replaced with materials which are acceptable to the Engineer. Any work or materials which in the opinion of the Engineer, is not of the character, quality, dimensions, or design, required by the plans and specifications, and which, in the judgement of the Engineer, is otherwise or in any manner defective, imperfect, or insufficient, shall be replaced or remedied, when pointed out to the Contractor by the Engineer; and shall be made good and sufficient by the Contractor at his/her own expense, and to the satisfaction of the Engineer, who shall have found, and whose duty it shall be to have any defective work or materials taken out and rebuilt or replaced at the expense of the Contractor. Any omission by the Engineer to disapprove of or reject any insufficient or imperfect work at the time of any estimate shall not be deemed in acceptance of such work or material.

The Contractor shall, to the satisfaction of the Engineer, rectify any defects in the works which may appear therein, or of which he shall receive notice from the Engineer and for which he may have been responsible, in the opinion of the Engineer, during the period of thirty days after the date of the final certificate of the completion of the work. If the Contractor fails to renew any defective materials, or correct any defective workmanship within 24 hours after he has been instructed to do so by the Engineer, the Engineer may cause any such defective work or workmanship to be removed. The expense of such removal will be deducted from any moneys that may be due, or that may thereafter be or become due to the Contractor.

The fact that any defective material or workmanship has been accepted previously by oversight of the Engineer or his representatives shall not be considered a valid reason for the Contractor's refusal to remove it or make it good when notified to do so.

16.0 MATERIALS FURNISHED BY THE DEPARTMENT. When the Department is required to supply materials under this Contract, the Contractor shall decide when materials are required on the work, and shall notify the Engineer giving reasonable advance notice.

The full amount of material in each shipment must be accounted for by the Contractor and any theft or loss, or damage to materials after receipt will be charged against him. Materials supplied to the Contractor by the Department shall not be used by the Contractor for any purpose other than that for which they were supplied. Should any material supplied by the Department be damaged while in possession of or under the control of the Contractor, they shall be replaced by the Contractor at their own expense.

17.0 LINES AND GRADES. The work, and all parts thereof, is to be constructed according to the lines and grades on the plans, and must conform accurately to the same. The lines and grades will be given by the Engineer or his representative, and the Contractor must carefully preserve from injury or disturbance all stakes and bench marks set during the progress of the work for marking lines and grades. Should errors be made by the Contractor in working to the lines and grades as given by the Engineer, such mistakes and errors must be made good by the Contractor at their own expense.

18.0 CONTRACTOR'S PERSONAL ATTENTION. The Contractor shall give his constant personal attention to the work while it is in progress, or he shall place it in charge of a competent and reliable agent or representative who shall have authority to act for, and be considered the lawful representative of the Contractor. Any orders, or instructions regarding the work, which shall be given to the said agent or representative, shall be considered as given to the Contractor. The Contractor shall at all times employ a sufficient number of workmen or foreman for the proper performance of the work, which he shall prosecute to full completion in the manner and within the time as specified.

19.0 REFUSAL OF CONTRACTOR TO DO WORK. Should the Contractor neglect or refuse to do any work, matter or thing that they may be directed to do, or which may be necessary in order to complete the work in a proper manner according to the plans and specification, the Engineer may without further notice

perform or do whatever in their judgement may be necessary. The entire cost shall be borne and paid by the Contractor, and may be deducted and paid out of any moneys which may be due or may thereafter become due the Contractor.

All machinery and other plant, materials, tools, equipment, articles and things whatsoever provided by the Contractor for the works hereby contracted for and not rejected or condemned for any reason shall, from the time of their being so provided, become, and until the final completion of the said work, shall be and remain the property of the Minister for the purposes of the said work; and the same shall on no account be taken away or used or disposed of otherwise, except for the purpose of the said work, without the written permission of the Engineer; and the Minister shall not be answerable for any loss or damage whatsoever which may happen to such machinery or other plant, materials, tools, equipment, articles and things, provided that always, upon the completion of the work and upon payment by the Contractor of all such moneys, if any, as shall be due from him to the Minister, such of the said machinery and other plant, materials and things, as shall not have been used and converted in the works, and which remain undisposed of, shall upon demand be delivered up and returned to the Contractor in such condition, as they may then be in.

Whenever on this contract, power or authority is given to the Minister, the Engineer or any person on behalf of the Minister to take any action consequent upon the happenings of any one of the events mentioned or referred to in the contract, or upon the acts, defaults, neglects, delays, breaches, non-observance or non-performance by the Contractor in respect of the works or any portion or details thereof, such powers or authorities may be exercised from time to time and not only in the event of the happenings of such contingencies before the time limited in this contract for the completion of the works, but also in the event of the same happenings after the time so limited in the case of the Contractor being permitted to further proceed with the execution of the work.

20.0 POWER TO EMPLOY ADDITIONAL RESOURCES

20.1 Insufficient Materials and/or Equipment. Notwithstanding the obligation of the Contractor to complete the contract within the time specified, where the Engineer is satisfied that the number of workers, equipment or materials used by the Contractor for the contract is insufficient to complete the contract within the time specified, the Engineer may, by written notice to the Contractor, require the Contractor to employ or provide such additional workers, equipment or materials as the Engineer may deem necessary to complete the contract within the time specified at the expense of the Contractor.

20.2 Employment of Additional Workers, Equipment, Materials by Minister. Where the Engineer is satisfied that the slow rate of progress on the contract is endangering the safety or health of any person or exposing part of it or public property to damage or destruction, the Engineer may either on behalf of the Minister or, if he sees fit as an agent or of account of the Contractor, but in either case at the expense of the Contractor, provide and employ such additional workers, equipment or materials as the Engineer thinks proper to diligently carry out the contract, and may pay such additional workers such wages, and for such additional equipment and materials, respectively, such prices as the Engineer thinks proper. All such wages and prices respectively are thereupon at once to be paid by the Contractor or the same may be retained or deducted out of any sum that may then, or thereafter, become due from the Minister to the Contractor; and the Minister may use in the execution and advancement of the contract not only the workers, equipment and materials so provided on their behalf, but also all such as may have been, or may be provided by, or on behalf of the Contractor.

20.3 Schedule of Work. The Contractor will be required to submit a schedule of work in accordance with the completion date of the project. No work shall commence until a work schedule has been provided to, and approved by the Engineer. The Engineer, may, during the course of the contract, require the Contractor to produce a revised schedule of completion indicating what additional workers, machinery, tools or other plant and equipment or the quantity of proper materials required to successfully conclude the contract within the completion date of the project.

21.0 SUBLETTING OR ASSIGNING OF CONTRACT. The work under this contract shall be performed by the Contractor, and by workers under the Contractor's immediate supervision and superintendence. The Contractor shall not, without the written consent of the Engineer, make any assignment of this Contract, or any subcontract for the execution of any of the works hereby contracted for.

This clause does not apply to the furnishing of materials for the different parts of the work, for which materials, however, the Contractor shall be held strictly responsible, and no excuse for the quality of the materials, or for the non-delivery of the same in good time by any Subcontractor, as effecting the progress of the work, will be entertained. In no case shall any assignment or subcontract, even though duly consented to, relieve the Contractor from his liability

under this contract for the performance and completion of the works hereby contracted for. The Contractor shall not assign any moneys due or accruing under the contract under any circumstances.

22.0 DELAYS BEYOND TIME LIMIT. No delay or delays within or beyond the time fixed for the completion of the work shall vitiate or render void the contract or any part thereof, or the obligations imposed upon the Contractor no delay shall make void or in any way impair or affect any current or other bond, guaranty, security, or obligation for the performance of the contract; the Contractor shall not have, nor make any claim or demand, nor bring any action, suit or petition against the Minister for any damage which he/she may sustain by reason of any delay or delays, from whatever cause arising in the progress of the work.

23.0 CONTRACTOR LIABLE FOR RISKS. The Contractor shall assume all risks and contingencies in connection with the work, and shall bear all loss or damage whatsoever, whether arising from storms, floods, fires, accidents or any other cause whatsoever which may occur to the works or any part thereof, during the progress of the work and until the same shall be fully and finally completed and delivered up to and accepted by the Minister. If any such loss or damage shall occur before such final completion, delivery and acceptance of the work, the Contractor shall immediately, at their own expense, repair, restore and re-execute the work so damaged within the specified time for completion. The Contractor must make good at his own expense all deficits and failures from any causes whatsoever, whether the same are due to negligence on his part, or on the part of his workmen, or persons employed by the Contractor, or under their control, or due to bad workmanship; and the Contractor shall indemnify and save harmless the Minister from any and all claims, losses or damages in respect thereof.

24.0 CONTRACTOR LIABLE FOR DAMAGES. The Contractor, agents and all work persons and persons employed by the Contractor or under the Contractor's control, and all servants and agents of his Subcontractor, if any, shall use due care that no person or property is injured and that no rights are infringed in the prosecution of the work. The Contractor shall be solely responsible for all damages, by whomsoever claimable, in respect of any injury to persons or to property of whatsoever description, and in respect of an infringement of any right, privilege or easement whatsoever, occasioned in the carrying on of the works or any part thereof, or by any neglect, misfeasance or non-feasance on the Contractor's part or on the part of any of his agents, workmen or persons employed by him or under his control or any of his Subcontractors, their servants or agents, and shall at his own expense, make such temporary provisions as may be necessary to ensure the avoidance of any such damage, injury or infringement, and to prevent the interruption of, or damage or menace to, the traffic on any public or private road, and to secure to all persons and corporations the uninterrupted enjoyment of all their rights, in and during the performance of the said works. The Contractor shall indemnify and save harmless the Minister from and against all claim and demands, loss, costs, damages, actions, suits or other proceedings by whomsoever made, brought or prosecuted, in any manner based upon, occasioned by, or attributed to any such damage, injury or infringement.

25.0 GRAVEL REMOVAL FROM RIVERS. In order to avoid situations whereby Contractors on highway work might destroy valuable fish spawning grounds by removing gravel from river beds, no work shall be done in, or material removed from the bed of a stream without the specific consent of the Project Engineer.

26.0 CLAIMS AGAINST CONTRACTOR. The Contractor shall promptly pay for all labour, services and materials, in or about the construction of the work; and all payments for such purposes, shall be made by the Contractor, at least as often as payments are made by the Minister to the Contractor. Payments to truckers employed in the hauling of materials used in the construction, shall be made bi-weekly with payment for one pay period made prior to the end of the following pay period.

Where a Subcontractor or supplier claims not to have been paid the amount owning under contract within 30 days after it is due, the Subcontractor or supplier may file a notice of claim with the Minister within 60 days after the initial 30 day period. The Minister will give notice of the Subcontractor or supplier's claim to the Contractor and retain the disputed amount until the claim is settled by the parties. If the Minister has not been advised within 60 days from the date of the notice of claim that the claim is settled by agreement, subject to an agreed upon dispute resolution process or that judicial proceedings have been commenced, the Minister will pay the disputed amount to the Contractor

Before final settlement is made for work done and materials furnished under the contract, the Contractor may be required to furnish evidence satisfactory to the Minister that the said work and all its parts are free and clear from all lawful claims or liens under any law, for labour, workmanship, material or otherwise; and that no claim then exists, in respect of which a claim or lien upon the said work could, or might attach. The Contractor shall indemnify and hold harmless the Minister, and all his property, from any and all kinds of liens, occurring from labour and services performed

and materials furnished, or otherwise, and any of the same, in or about the said work. In the event the Minister consents in writing to any subcontract for the execution of any work hereby contracted for, the Contractor shall ensure that all accounts for labour, services and materials in or about the construction of that part of the work are paid by the Subcontractor and shall furnish for the Minister a certificate in writing that such accounts have been paid.

27.0 CLAIMS OF CONTRACTOR. It is intended that every allowance to which the Contractor is fairly entitled will be embraced in the Engineer's monthly certificate; but, should the Contractor at any time have claims of any description which he considers are not included in the said certificate, such claims must be made in writing to the Engineer within 30 days after the date of the delivery to him of the certificate, from which he considers the items of his claims to have been omitted, and in no case beyond the period of 60 days from the date of the practical completion of that portion of the work, to which such claims apply. In default of the presentation of such claims within the time or times so limited, the Minister may treat such claims as absolutely barred. The Contractor in presenting claims of the kind referred to above, must accompany them with satisfactory evidence of their accuracy, and the reasons for the claims.

Where after the tender closing date for this contract, there is a change in the amount of Federal Excise Tax or Import Duties payable on materials placed or furnished or to be placed or furnished in the work, the Department will increase or decrease contract payments by the amount necessary to offset the effect of the Tax or Import Duties on this contract.

Claims by the Contractor for compensation to cover increased costs caused by the Tax or Import Duties must be submitted to the Engineer within **30 days after the Engineer's Certificate of Final Estimate** is received by the Contractor. No claim submitted beyond the 30 day limit will be considered.

Where the Contractor benefits from a change in the Tax or Import Duties, the Contractor shall submit to the Engineer a statement of such benefits. This statement must be provided within **30 days after the Engineer's Certificate of Final Estimate** is signed.

The Engineer reserves the right to make deductions from regular progress payments to account for any estimated benefits accrued to the Contractor from the Tax or Import Duties. Such deductions will be held pending receipt of the above mentioned statement itemizing the benefits which the Contractor has received from the Tax or Import Duties, at which time the final payment adjustment will be determined. (See also Division 1 Section 2 Paragraph 6 of these Specifications)

28.0 SANITARY PROVISIONS. All Contractors shall provide and maintain in a condition satisfactory to the Engineer all necessary accommodations for the use of their employees on the work.

29.0 CHARACTER OF WORKMAN AND EQUIPMENT. The Contractor shall at all times employ sufficient labour and equipment for prosecuting the several classes of work to full completion in the manner and time specified.

Any person employed by the Contractor, who, in the opinion of the Engineer, does not perform their work in a proper and skilful manner, or is disrespectful, intemperate, disorderly, or otherwise objectionable shall, at the written request of the Engineer, be forthwith discharged and such persons shall not again be employed in the work.

All machinery and equipment owned or controlled by the Contractor, which is proposed to be used on the work shall be of sufficient size and in such mechanical condition as to meet with the requirements of the work, to produce a satisfactory quality of work. The Engineer may order the removal and require replacement of any unsatisfactory equipment.

No change in the machinery and equipment employed on the work, which shall have the effect of decreasing its capacity, shall be made except by written permission of the Engineer. The measure of the capacity of machinery and equipment shall be its actual performance on the work.

30.0 RECORDS OF CONTRACTOR OPEN FOR INSPECTION. The Contractor shall keep complete records of the time worked by each of their employees on this work, and such pay-rolls, time books, books or accounts, invoices and statements shall be at all times open for inspection and audit by the Minister or Minister's representative, who shall be assisted in every possible way by the Contractor to enable the Minister or such representative to ascertain as far as possible, the exact payment, sums or claims so due and remaining unpaid by the Contractor.

31.0 NOTICE TO CONTRACTOR. Any notice, order, direction or other communication mentioned in this contract to be notified, or given the Contractor, shall be deemed to be well and sufficiently notified or given, if the same be given by the Engineer or Engineer's representative, and be delivered to the Contractor personally or the Contractor's representatives or foreman on the work, or left at the Contractor's office, or mailed in any post office to the Contractor or his

agent, addressed to the address mentioned in this Contract, or to the Contractor's last known place of business or residence.

32.0 CLEANING OF PREMISES. The Contractor shall upon completion of the work remove all temporary structures and clear away all rubbish, surplus and waste materials remaining on or about the works and place the premises in a neat and tidy condition satisfactory to the Engineer.

33.0 FIRE PROTECTION. The Contractor shall, at his own expense, take special precautions to prevent fire occurring in or about the works, and employ his own workmen, to the satisfaction and under the direction of the Engineer, in extinguishing all such fires which may occur. The Contractor shall observe and comply with all laws and regulations and instructions made and given, from time to time during construction, by the Engineer, with respect to fires and the prevention and extinguishing of fires, and shall pay all wages and other costs occasioned by reason of the observance or compliance with such regulations and instructions.

34.0 ACCOMMODATING TRAFFIC AND TRAFFIC CONTROL. Unless otherwise provided, the Contractor shall, at his own expense and without extra cost to the Minister, make suitable provision to accommodate all traffic, either pedestrian or vehicular over any part of the highway upon which work is being performed, in a manner satisfactory to the Engineer and shall arrange to keep two lanes of highway open to traffic at all times with the least amount of inconvenience to the travelling public. On upgrading work the subgrade shall be completed progressively in order that the various courses of gravel may follow in an orderly manner. The grading operation shall not precede the gravel operation by a distance greater than 1 km and not more than 1 km of the original travelled way shall be disrupted at any one time. However, other work not affecting the original travelled way may proceed as directed by the Engineer.

Prior to closing down the operation on each working day, the Contractor shall ensure that the travelled way is capable of carrying traffic even under adverse conditions. The reconstructed travelled roadway is to be well maintained and graded on a daily basis by the Contractor as directed by the Engineer until the completion of the Contract.

Where in the opinion of the Engineer, it is desirable to;

- detour traffic via alternate highways because of construction work on a project and
- where short detours are required around excavations, partially built structures, etc., on work under contract, the Contractor is to be paid for the cost of construction and maintenance of the detour.

The Contractor is advised that construction signs for any contract shall not be erected until immediately prior to the commencement of work.

The Contractor shall be responsible to provide and maintain all traffic control required on the Contract. Traffic Control shall be carried out in accordance with the current edition of the Nova Scotia Traffic Control Manual and as directed by the Engineer.

The Contractor shall provide an Accredited Traffic Sign Supervisor, who has successfully completed the Temporary Workplace Traffic Control Training Course to be on site at all times when active construction is taking place, to ensure the dismantling of all temporary condition signs and devices that indicate to the road user that highway construction activities exist and also to ensure that proper traffic control procedures are carried out in accordance with the Nova Scotia Traffic Control Manual.

The Contractor may, if so requested by the Engineer or other approved traffic authorities, be required to submit a list of workmen to whom concerns about the condition of all or any, of the Traffic Control devices, required for the Contract, can be directed during non active construction periods.

Traffic Signs, drums and cones required for traffic control shall be supplied by the Contractor at no cost to the Department.

All TC-5 (ROAD WORK) and TC-6 (TRAFFIC CONTROL PERSON AHEAD) signs used on any job shall be equipped by the Contractor with two flags (including flag holder), at no cost to the Department, as per the requirement of the Nova Scotia Traffic Control Manual. All signs shall be Level I reflectivity as per specification 62-GP-11M.

The supply, handling, erection, placement and removal of all traffic control items shall be the responsibility of the Contractor. Such items may include, but not necessarily be limited to, the provision of traffic control persons; flashing light units; pilot vehicles; signs; cones; drums, including the maintenance of such devices during inactive construction periods. Traffic Control will not be paid for separately, and all associated costs shall be included in the unit price for other tender items.

On low volume roads and low volume urban residential streets where a 360 degree amber light is required in the placement and dismantling of safety devices, the 360 degree amber light (and vehicle) shall be supplied by the Contractor at no cost to the Department.

Unless specified elsewhere in these provisions it shall be the Contractor's responsibility to erect and maintain

all signs relative to any contract to meet the requirements laid down in the current edition of the Nova Scotia Traffic Control Manual.

35.0 DESIGNATED HIGHWAYS. The Minister as provided for in Section 6 of the Regulations respecting the Weights and Loads of Vehicles made pursuant to the provisions of Section 172 of the Motor Vehicle Act will designate certain portions of highways as follows with or without a formal request having been made as indicated.

35.1 Grading Contracts.

35.1.1 The section of highway under contract excepting all bridges will be designated at the time said contract is awarded without formal request from the Contractor.

35.1.2 Bridges within the limits of the contract may be designated on formal request from the Contractor provided the structure is deemed capable of bearing the increased loading. The Contractor may be required to reinforce the structure to the satisfaction of the Engineer.

35.1.3 Sections of highway and bridges therein that may be used for purposes incidental to a highway under contract may be designated on formal request from the Contractor. The Contractor may be required to reinforce the structure to the satisfaction of the Engineer.

35.2 Upgrading Contracts.

35.2.1 A section of highway under an upgrading contract may be designated on formal request from the Contractor provided the request is favourably recommended by the District Director, except the designation will not be permitted on any paved highway or paved portion of the contract. If a paved surface is to be pulverized, designation will be considered.

35.2.2 Bridges within the limits of the contract may be designated on formal request from the Contractor provided the structures are deemed capable of bearing the increased loading. The Contractor may be required to reinforce the structure to the satisfaction of the Engineer.

35.2.3 Sections of highway and bridges therein that may be used for purposes incidental to a highway under contract, may be designated on formal request from the Contractor. The Contractor may be required to reinforce the structures to the satisfaction of the Engineer.

35.3 Paving Contracts.

35.3.1 A section of highway under a paving contract may be designated on formal request from the Contractor provided the request is favourably recommended by the District Director, except the designation will not be permitted on any paved highway or paved portion of the contract.

35.3.2 Sections of highway and bridges therein that may be used for purposes incidental to a highway under contract, may be designated on formal request from the Contractor. The Contractor may be required to reinforce the structures to the satisfaction of the Engineer.

35.4 Repaving Contracts. A section of highway under a repaving contract will not be designated because of its paved surface. If the surface is to be pulverized, then consideration may be given to the designation.

A section of highway designated by the Minister is only designated with respect to vehicles owned or hired by the Contractor or his Subcontractor and being used to do work on the contract.

The Contractor shall, at no cost to the Department, carry out grading, gravelling, and dust control operations on the designated road(s) as required to maintain a riding surface acceptable to the Department during the course of the operation. Said road(s) shall be left in a condition acceptable to the Department on completion of the work.

36.0 REGISTERED WEIGHT AND AXLE WEIGHT. The maximum permitted weight on an axle, combination of axles, vehicle or combination of vehicles on any public highway in Nova Scotia shall be in accordance with Regulations Respecting the Weights and Loads of Vehicles made pursuant to Section 191 of the Motor Vehicle Act, Chapter 293 R.S.N.S. 1989 as amended by 1990 c.36 by the Minister and in effect at the time the vehicle (or axle) is in use.

37.0 WEIGHING PROCEDURES. The weighing procedures to be followed by Department weighers on contract or Department work will be carried out on the basis of determining "Pay Load" only.

Trucks hauling on contract or Department projects, and weighed by Department weighers will not be issued a weight slip if the total gross is in excess of the vehicle's registered weight plus the allowable axle tolerance.

A sign which reads as follows must be prominently displayed on each scale house so that it can be

easily read by the Truck Driver.

THIS SCALE WILL DETERMINE PAY LOAD ONLY. NO WEIGHT SLIP WILL BE ISSUED IF THE TOTAL LOAD EXCEEDS REGISTERED WEIGHT PLUS TOLERANCE. THE DRIVER IS LEGALLY RESPONSIBLE IF THE AXLE WEIGHT ON HIS VEHICLE EXCEEDS THE PERMITTED MAXIMUM AXLE WEIGHT PLUS TOLERANCE. AXLE WEIGHT WILL BE CHECKED PERIODICALLY BY MOTOR VEHICLE INSPECTORS.

The scale house sign is available from the Department Sign Shop at Truro as Number 05.

The truck driver is legally responsible to ensure that the legal axle limits plus tolerances are not exceeded.

If possible, the truck axles or axle groups should be weighed during the first several days of the trucking operation and the gross load should be near the permitted registered weight.

To assist the trucker in meeting the legal regulations Department weighers will:

37.1 Initial Weighing of Axles. Weigh axles or axle groups on each loaded vehicle once during the initial phase of the truck operation and advise the trucker of the axle loadings.

37.2 Additional Weighing of Axles. Following the initial axle weighing, subsequent weighing of axles will be done at the trucker's request. The trucker is to be advised accordingly.

37.3 WEIGHING WILL BE PERMITTED UNDER THE FOLLOWING CONDITIONS:

- **Single Weighing Procedure.** Prior to proceeding onto the scale platform, vehicles shall come to a complete stop. The vehicle shall then be driven onto the platform at a minimum speed and shall be gradually stopped centred on the platform. Before weighing, the brakes shall be released to insure there is no displacement of the scale components.
- **Split Weighing Procedures.** The practice of split weighing, for purpose of payment, is not permitted on Department contracts.

38.0 TRUCK WEIGH SCALE

38.1 Contractors Responsibility to Supply Scales. It is the Contractor's responsibility to supply, install, inspect and maintain in good working order, truck weigh scales approved for use by Measurement Canada Industry Canada for weighing various materials such as gravels, asphalt concrete, rock fill, etc. on contracts on Department projects. All costs related to supply, installation, maintenance and inspection of scales shall be included in the unit price for the various materials to be weighed. Such scales will be tested occasionally by Measurement Canada Industry Canada and/or the Engineer or his staff. The Contractor shall supply scales of sufficient length to accommodate weighing of all trucks, used on the contract, by the single weighing procedure.

Contractors have the option of combining scales of the same make and model. Once this is done the Contractor must have these scales checked and certified by Measurement Canada Industry Canada as they are considered new scales. All costs associated with checking of these scales will be the responsibility of the Contractor.

If the vehicle scales from which Department weigh slips will be issued, are not located between the pit and a public road or if the asphalt plant is equipped with certified hopper scales, the Contractor must provide a suitable weighing mechanism (including weigher), at the pit so vehicle weights can be checked. Approximate weights can be determined by using loader scales or by split weighing on a smaller set of scales located at the pit.

If scales in a pit are located more than 500 metres from the point of loading, a dump location must be available at the scales. If a truck is required to travel more than 500 metres within the pit to dump excess material, the Contractor must reimburse the trucker for their travelling (tonne-km) and carrying of this excess material.

The scale and scale house must comply with the requirements of the **Occupational Health and Safety Act and Regulations.**

38.2 Contractors Responsibility to Supply Test Weights. It is the Contractor's responsibility to supply, at his expense, 10,000 kg of certified test weights to carry out the necessary testing.

Test weights shall be inspected and certified for use by Measurement Canada Industry Canada at least once annually. The inspection shall be done prior to use of the weights in any particular year. If at any time it is suspected that the mass of the test weights has changed through damage or otherwise, they may be rejected by the Engineer until such time as they are re-certified. It is the Contractor's responsibility to make all arrangements and bear all costs with respect to the certification of the weights. The certification shall be carried out at facilities as specified by Measurement Canada Industry Canada.

38.3 Scale Beam Calibration. The scale beam or

other mass indicating device shall be calibrated in metric units, as frequent as required.

38.4 Scale Testing and Certification. All truck weigh scales shall be tested and certified by an independent scale inspection company. The company must have at its disposal a minimum of 10 000 kg or 20 000 lbs of test standards with proof of current Measurement Canada Industry Canada calibration certification. The test standards must all be of the same unit of measure, imperial or metric. Mixing weights of different units of measure for the calibration will not be permitted. Normally, at two (2) week intervals during the period the scales are in use, Department personnel will perform reinspection of the scales. It will be the responsibility of the Contractor to provide personnel to handle test weights and to make adjustments if required during the testing procedure. The Contractor shall also make available a loaded tandem truck to be used during the test procedure, all at no cost to the Department.

Measurement Canada Industry Canada may conduct unscheduled inspections at any time. If during the process of carrying out this unscheduled inspection, the scales are non-verified or seized due to measurement errors, a re-inspection and certification by Measurement Canada Industry Canada must be performed before the scales may be used for issuing weigh slips. All costs associated with having the scales re-inspected by Measurement Canada Industry Canada are at the Contractor's expense.

The Contractor is responsible for arranging for inspection of the vehicle scales and/or asphalt plant hopper scales for accuracy and compliance with the Weights and Measurements Act and Regulations. The Contractor shall hire an independent scale inspection company to perform the inspection. Portable scales shall be inspected prior to being used for the first time and for each subsequent set-up, if the scale is moved, in the construction season. Permanent scales shall be inspected once every twelve months.

All costs associated with set-up and initial inspection of a scale are the responsibility of the Contractor. A dated report and sticker from the independent scale company shall be posted at the scale. Copies of the inspection report shall be forwarded to Measurement Canada Industry Canada and to the Department's Engineer.

The Engineer reserves the right to perform periodic inspections on the scale. Upon request of the Engineer the Contractor shall engage an independent scale company to verify calibration of a scale. The Contractor has a maximum of seven days in order to re-inspect the scale. If the scale is in compliance the Department will pay the cost of the re-inspection. If the scale does not comply, the Contractor is responsible for the cost of the re-inspection and any costs associated with repairing the scale. Any costs associated with delays as a result of the re-inspection are the responsibility of the Contractor.

38.5 Requirements Of Portable Scale Houses. A weatherproof scale house shall be provided by the Contractor. It shall have a minimum floor area of 2.25 square metres, a ceiling height of 2.15 metres and a minimum of 0.91 metres free area measured from the back wall. Safe access via steps, etc. shall be provided to the doorway, which shall open outwards (access to meet all required codes). The door shall have a locking device and a key shall be provided to the weigher. The door shall be located on either of the walls perpendicular to the scale platform or the wall parallel to, and furthest from, the scale platform. Two sliding windows with screens shall be provided; one on the end of the scale house to provide a clear view of vehicles as they approach the scale platform; the other on the scale platform side of the scale house from which the weigher can transfer the weigh ticket to the truck driver. A storage area for a water container shall be provided (container and water shall be supplied by the Department) as well as an adequate stool and work surface for a ticket machine. Adequate heat and light sources shall be provided when required (both to meet all required codes). Toilet facilities must be readily available.

The floors of the scale house shall be insulated and the side walls shall be insulated if the scales are in use outside of the period May 15 to September 15. If dust is a problem, measures shall be taken to suppress it around the scale house or an adequate ventilation or filter system to handle dust shall be provided. Vehicles shall be weighed in such a manner that exhaust fumes are directed away from the scale house.

The certification of scales will depend, in part, on the following conditions being met:

- The beam stand shall be rigid and supported to prevent springing under load and vibrating when a loaded vehicle drives onto the scale platform.
- The connecting rod between the weigh beam and the lever system shall be plumb and have ample clearance where it passes through the scale house floor.
- The various components of the weigh beam including pivots, bearings and beam notches shall be clean and free from rust and wear. The weight indication must be readable. The nibs, dogs or pawls shall engage positively in the beam notches. The balance ball must be secured in position when the beam is brought to balance.
- The counter balance hangers shall not have loose material or easily removable weights hung from them.

- The scale operator must have an unobstructed view of the scale platform.

38.6 Scale Deck. The scale deck shall have an easy free floating movement with ample clearance at the ends and sides. The end walls or abutments shall be adequately separated to prevent displaced ramp materials from rolling into the pit and packing about the levers.

38.7 Curb Rails and Guide Post System. All scales used on Department contracts shall comply with the following:

- **Curb Rail.** Where the width of the scale platform permits, a curb rail system shall be installed on both sides of the platform.
  The curb rail system shall consist of either:
  - 200 mm x 200 mm timbers bullnosed on the inside or;
  - 200 mm high steel rail welded to the scale beam.
- **Single Rail and Guide Posts.** Where the width of the scale platform does not permit the installation of a curb rail system on both sides of the platform, a single rail shall be installed on the scale house side. Guide posts shall be installed on the other side.

  If guide posts are used they shall be placed at both ends of the scale and aligned with the edge of the platform and preferably be constructed of minimum 75 mm diameter steel pipe or equivalent.
- **Guide Posts.** Where a scale house is located more than 3.7 m from an elevated scale platform, there shall be four guide posts installed at the corners of the scales as a guide for the truck drivers in lieu of a curb rail system.
- **Curb Rail Not Required.** Where the scale platform is flush with the ground level or other surfaces, a curb rail system is not required.

38.8 Foundations. Scales must be level at all times to operate properly. The type of foundation required will depend largely on the soil condition and length of time of intended use in that location.

Shims and other means of height adjustment shall be made of any suitable material that resists compression at least as well as the main support structure, and shall cover the entire area under the lever stands or load cell bases to ensure that the scale remains stable and level under normal conditions of use of the scale.

38.9 Drainage. Proper drainage of the area surrounding the pit shall be provided. This may require ditching or drainage tiles, etc. depending on the length of time the scale is to remain on the site. Water shall not be allowed to undermine the foundation. The area under the scale shall be free of all debris, old roots, sand, gravel, etc.

38.10 Approach Ramps. The approach ramp and off ramp shall be level (0 degree incline) for at least the length of the longest vehicle being weighed. The area under the approach ramps shall be free of all debris, old roots, sand, gravel, etc. and the ramps shall be firm and well compacted to prevent settling. The ramps shall be inspected regularly and any ruts or settlement corrected immediately.

38.11 Lever System. Levers must be in alignment, level and free of rust. The pivots and bearings must be clean, free of rust and wear. Anti-friction plates or caps or any other mechanical means used to limit side play or movement of knife edges in their bearings should be replaced, if missing.

38.12 Inspections, Tests, Allowable Tolerances. Scale tolerances and test weight requirements for certification shall be as illustrated in Table 1-4-1. Inspection shall involve the following tests:

- "zero balance"
- "sensitivity" (load discrimination)
- "preliminary performance" test which indicates the general condition of the scale and its installation.
- "strain load test"

38.13 In General. Any additional requirements contained in legislation will take precedent over requirements contained herein.

Table 1-4-1 AGREEMENT BETWEEN DEPARTMENT OF TRANSPORTATION & PUBLIC WORKS AND MEASUREMENT CANADA REGARDING SCALE TOLERANCES, IN SERVICE LIMITS OF ERROR

Verification scale interval	2 kg	5 kg	10 kg	20 kg
In-Service LOE in Terms of Verification Scale Interval	Load in kg	Load in kg	Load in kg	Load in kg
1	0 - 1000	0 - 2500	0 - 5000	0 - 10000
2	+1000 - 2600	+2500 - 6500	+5000 - 13000	+10000 - 26000
3	+2600 - 4200	+6500 - 10500	+13000 - 21000	+26000 - 42000
4	+4200 - 5800	+10500 - 14500	+21000 - 29000	+42000 - 58000
5	+5800 - 7400	+14500 - 18500	+29000 - 37000	+58000 - 74000
6	+7400 - 9000	+18500 - 22500	+37000 - 45000	+74000 - 90000
7	+9000 - 10600	+22500 - 26500	+45000 - 53000	+90000 - 106000
8	+10600 - 12200	+26500 - 30500	+53000 - 61000	+106000 - 122000
9	+12200 - 13800	+30500 - 34500	+61000 - 69000	+122000 - 138000
10	+13800 - 15400	+34500 - 38500	+69000 - 77000	+138000 - 154000
11	+15400 - 17000	+38500 - 42500	+77000 - 85000	+154000 - 170000
12	+17000 - 18600	+42500 - 46500	+85000 - 93000	+170000 - 186000
13	+18600 - 20200	+46500 - 50500	+93000 - 101000	+186000 - 202000
14	+20200 - 21800	+50500 - 54500	+101000 - 109000	+202000 - 218000
15	+21800 - 23400	+54500 - 58500	+109000 - 117000	+218000 - 234000
16	+23400 - 25000	+58500 - 62500	+117000 - 125000	+234000 - 250000
17	+25000 - 26600	+62500 - 66500	+125000 - 133000	+350000 - 266000
18	+26600 - 28200	+66500 - 70500	+133000 - 141000	+266000 - 282000
19	+28200 - 29800	+70500 - 74500	+141000 - 149000	+282000 - 298000
20	+29800 - 31400	+74500 - 78500	+149000 - 157000	+298000 - 314000
21	+31400 - 33000	+78500 - 82500	+157000 - 165000	+314000 - 330000
22	+ 33000	+82500	+165000	+330000

The in-service limits of error that apply to a Class IIIHD weighing device are ±1 e where the load is not less than zero and not more than 500 verification scale intervals, and where the load exceeds 500 verification scale intervals, calculated by adding ±1 e for each additional 800 verification scale intervals or less, to a maximum of ±22 e.

39.0 CONDITION OF ROADS IMMATERIAL. Whenever it becomes necessary to transport the Contractor's plant, machinery or materials over roads adjacent to or leading to the work under this contract, the Contractor shall have no claim against the Minister for any cost or delays that may be incurred or occasioned by reason of the condition of said roads, or of any bridge or obstruction.

40.0 PATENTED DEVICES, MATERIALS AND PROCESSES. The Contractor shall indemnify fully the Minister against all suits or actions arising from the claims of any person or persons who are, or claim to be, the patentees of any process used in connection with the work, or of any materials, plant machinery, tools or appliances, used therein, or thereon, or in any way in connection therewith.

41.0 BORROW, GRAVEL AND PLANT MIX AGGREGATE PITS AND PLANT SITES. All excavation work carried on outside of normal highway embankments for the purpose of supplying common, rock, gravels, and plant mix aggregates, or for providing a hot mix plant site, shall be done under the direct supervision and with prior approval of the Engineer. Except in areas where it is impractical to do so, all such excavations shall not be visible from the Highway.

The work shall be carried out in such a way that all waste material from clearing, grubbing, screening, and material selection operations will be disposed of properly in a manner that will not present an unsightly appearance or endanger or pollute the adjacent lands, rivers, lakes, or other water courses.

On completion of the work, the perimeter of the area shall be uniformly sloped, all waste material including boulders, grubbing, asphalt spillage, etc., shall be properly disposed of and the entire excavation area shall be uniformly graded and adequately drained in preparation for possible future seeding by the Department, all in accordance with the Pit and Quarry Regulations in effect at the time of the award of the contract and to the satisfaction of the Engineer.

42.0 LAND ACQUISITION. At the time of award of a contract all the required right-of-way may not have been acquired by the Department. The Contractor is not permitted to work on any section of a contract until first obtaining permission from the Engineer. Delays in acquiring the necessary right-of-way by the Department shall not constitute a claim on the part of the Contractor for damages or for any loss of anticipated profits.

43.0 PAYMENTS. Cash payments equal to 90% of the total value as shown on the Financial (Progress Estimate) Report done, as valued by the Engineer, will be made to the Contractor monthly, as the work progresses, on the written certificate of the Engineer that the work for, or on account of which the certificate is granted, has been duly executed to the Engineer's satisfaction, and stating the value of such work as computed by him, and the said certificate, shall be a condition precedent to the right of the Contractor to be paid the said percentage, or any part thereof. The Engineer may after the value of the work done exceeds one half the aggregate amount of the tender, increase the cash payments to 95% of the value of the work done. No such monthly payment shall be construed to be an acceptance of any defective work or improper materials. Whenever the work is finished, according to the plans and specifications the Engineer shall certify the final estimate which signifies that the work is done to his satisfaction. Subject to the other provisions of this contract the Minister will then pay to the Contractor within 60 days, but not before 30 days, after execution of the said final certificate the remainder which shall be found to be due, excepting therefore such sum or sums as may be lawfully deducted or retained under any of the provisions of the contract. The written certificate of the Engineer certifying to the final completion of the said work to his/her entire satisfaction shall be a condition precedent to the right of the Contractor to receive or to be paid the balance due, or any part thereof.

The right is reserved by the Minister to reject the whole or any part of the work, should the said certificate be found to be inconsistent with the terms of the contract, or otherwise improperly given.

The Engineer's progress certificates, and the payment of progress estimates based upon the same, shall not be construed an acceptance or approval of the work, but only as temporary advances to the Contractor. The Contractor shall be bound, notwithstanding such progress estimates, to well and truly complete, finish and hand over in good condition, and to the entire satisfaction of the Engineer, by the time specified and in accordance with the terms and conditions of the specification, the whole of the work included herein, and all the percentage retained by the Minister shall be retained by him, until the said full and satisfactory completion has been formally certified by the Engineer. No moneys payable, due or accruing under this contract shall be assigned without the consent in writing of the Engineer.

44.0 ANNULMENT OF CONTRACT. In case the Contractor shall make default or delay in commencing, or in diligently executing any of the works or portions thereof to be performed, or that may be ordered under this contract, to the satisfaction of the Engineer, the Engineer may give written notice to the Contractor requiring him to put an end to such default or delay.

Should such default or delay continue for six days after such notice shall have been given by the Engineer to the Contractor, or should the Contractor make default in the completion of the works, or any portion thereof, within the time limited with respect thereto in or under this contract, or should the Contractor become insolvent, or abandon the work, or make an assignment of this contract without the consent required, or otherwise fail to observe and perform any of the provisions of the contract, then in any of such cases, the Minister without any further authorization, may take all the work out of the Contractor's hands and may employ such means as he may see fit to complete the works. In such case the Contractor shall have no claim for any further payment in respect of work performed, but shall be chargeable with and shall remain liable for all loss and damage which may be suffered by reason of such default or delay, or the non-completion by the Contractor of the works. No objection or claim shall be raised or made by the Contractor by reason, or on account of the ultimate cost of the works so taken over, for any reason proving greater than, in the opinion of the Contractor, it should have been, and all materials, articles, and things whatsoever, and all machinery, tools, plant and equipment, and all rights, proprietary or otherwise, licenses, powers and privileges, whether relating to or effecting real estate or personal property, acquired, possessed or provided by the Contractor for the purposes of the work, or by the Engineer under the provisions of this contract shall remain and be the property of the Minister for all purposes incidental to the completion of the works, and may be used, exercised and enjoyed by the Minister as fully to all intents and purposes connected with the works as they might therefore have been used, exercised and enjoyed by the Contractor. The Minister may also at his option, sell or otherwise dispose of, at forced sale prices, or at public auction or private sale, or otherwise, the whole or any portion or number of such materials, articles, things, machinery, tools, plant and equipment at such price or prices as he may see fit, and retain the proceeds of any such sale or disposition and all other amounts then or thereafter due to the Contractor on account of, or in part satisfaction of any loss or damage which the Minister may or may have sustained by reason aforesaid.

45.0 OCCUPATIONAL HEALTH AND SAFETY ACT.

It is mandatory on all Department contracts that the Contractor immediately report all incidents that have involved contact with electrical power lines, poles supporting electrical power lines, or other lines or poles that could impact electrical power lines to Nova Scotia Power Inc. and/or MTT as applicable and also the Department of Labour and the Department Supervisor for the project. If an accident occurs involving electrical power and/or communication lines, the Contractor shall appoint a representative to serve on a Joint Use Accident/Incident Investigation Committee.

It shall be the Contractor's responsibility to become familiar with the requirements of the current Occupational Health and Safety Act of Nova Scotia and shall conduct his work so as to conform to the Act.

Copies of the Occupational Health and Safety Act and the Regulations may be purchased through Service Nova Scotia and Municipal Relations, P O Box 637, Halifax, N. S. B3J 2T3
Phone No. 424-7580 or 1-800-526-6575
Internet or e-mail: www.gov.ns.ca. (Select link to Government Publications) or publications@gov.ns.ca

46.0 BLASTING

46.1 Blasting Near Watercourses. Blasting in or near watercourses shall receive approval from the Department of Fisheries and Oceans, and shall be in accordance with the "Guidelines for Use of Explosives in Canadian Fisheries Waters" (DFO; April 1993).

46.2 Occupational Health and Safety and Other Regulations. All blasting carried out on this project shall be in accordance with the Regulations made pursuant to the Occupational Health and Safety Act, Chapter 320 of the Revised Statutes of Nova Scotia. The requirements as set out in the Occupational Health and Safety Act are deemed to be minimum requirements and the Contractor shall conduct his operations in such a manner so as to comply with any and all other Act(s) or Regulations in effect at the time of blasting.

46.3 Claims for Damages. It shall be the responsibility of the Contractor to satisfy all claims for damages as a result of blasting.

46.4 Public Notification. The Contractor or his/her agent shall notify the general public through radio or news media that blasting will be taking place in a particular area and the anticipated duration of work should be specified.

46.5 Prerequisites Required Before Blasting Permitted. No blasting or use or storage of explosives shall be permitted on this project until the Contractor has provided proof of the following to the Engineer:

- That the blaster has a valid "Blaster's Certificate"
- That the Contractor has procured any blasting permit specific to the project required by any jurisdiction.
- That the Contractor has in effect, adequate insurance with reasonable deductible to cover any anticipated loss that may occur through claims or otherwise that may occur.
- That the Contractor has conducted a pre-blast

survey of any structures in the area that may be affected by the blasting.

The Contractor shall provide a copy of the blast design to the Engineer, if requested to do so by the Engineer, before a particular blast is made.

46.6 Delays in Traffic / Damage to Pavement. The Contractor shall ensure that the amount of rock that may be blown onto the existing pavement is minimized and that the time of blasting is such to provide minimum delays to the travelling public. The Contractor shall have adequate and appropriate equipment available near the site of the blast to remove any rock that may be blown onto the roadway in such a manner to avoid damage to the pavement and, in a timely fashion, to minimize delays to traffic. The Contractor shall be responsible and satisfy all claims for damage to property of the Provincial Crown including, but not limited to, the roadway.

46.7 Compliance Monitoring. The Contractor shall retain a qualified consultant to monitor ground vibration and air shock waves of all blasts. The monitoring results shall be provided to the Engineer within 48 hours of the blast or sooner, if requested by the Engineer.

46.8 Magnitude of Blast. Blasting is to be done in a manner that all three components of ground vibrations shall not exceed 12.5 mm/sec (0.5 in./sec) and air concussion as measured by peak over pressure shall not exceed 0.003 lbs/sq.in. or 128 decibels as measured in the ground adjacent to the nearest structure and any other structure where it is anticipated the values will be higher than at the nearest structure.

46.9 Cost. All costs associated with blasting as described herein shall be considered incidental to the work involved with tender pay items such as, Solid Rock Excavation, Foundation Excavation Solid Rock, etc.

47.0 REGULATIONS AND GUIDELINES CONTAINED IN APPENDIX B. Regulations and guidelines contained in Appendix B are provided for information only. Procurement of the most current editions to these regulations and guidelines from the issuing authority is the responsibility of the Contractor. The Contractor shall conduct the work in accordance with said edition and/or the terms and conditions of the approvals granted by said authority. If there is a conflict, in the terms and conditions, between the approved guidelines and the actual permit, the more stringent conditions shall apply.

48.0 DEFAULT OR REMOVAL OF WORK FROM THE CONTRACTOR.

48.1 Causes and Notices. Where a Contractor:

- has defaulted or delayed in commencing or, in the Department's opinion, has defaulted or delayed in diligently or suitably executing the Work or any portion thereof to the satisfaction of the Engineer and the Engineer has given notice thereof to the Contractor and has by such notice required the Contractor to put an end to such default or delay and such default or delay continues for two working days (48 hours) after such notice was given,
- has made default in the completion of the work, or any part thereof, within the completion date(s) of the Contract,
- has become insolvent,
- has committed an act of bankruptcy,
- has abandoned or discontinued prosecution of the Work,
- has made an assignment of the Contract without the required approval, or
- has otherwise failed to observe or perform any of the provisions of the Contract,

The Department may take all or any portion of the Work out of the Contractor's hands and may employ such means as seen fit to complete the Work.

48.2 Costs and Claims. Where the Work or any portion thereof has been taken out of the Contractor's hands under subsection 48.1, Causes and Notices, all costs incurred by the Department as a result of the default, including the cost of completing the Work and repairing any defect or failure, will be deducted from any money due or which may become due to the Contractor. If the costs incurred by the Department exceed the sum which would have been payable under the Contract, then the Contractor, shall be liable and shall pay to the Department the amount of the excess up to the specified amount of the security deposit.

The Contractor shall not have any claim for compensation or damages against the Department for any stoppage or delay caused by or resulting from the Work, or a portion of the Work having been taken out of the hands of the Contractor.

49.0 DEFECTS AND OMISSIONS.

49.1 Rectifying Defaults. Without restricting any warranty or guarantee either expressed in this agreement or implied or stipulated by law, the Contractor shall at their own expense rectify and make good any defect or fault or omission that appears in the work within twelve (12) months or within such additional period of time stipulated in the Special Provisions or Standard Specification concerning particular portions of the work from the date of the Engineer's Certificate of Final Estimate.

49.2 Notice To Contractor. If any defect, fault or omission appears in the Work and the Engineer is of the opinion that it is one which the Contractor, either under a warranty or guarantee either expressed in this agreement or implied or stipulated by law, is obliged to remedy and make good, the Engineer may direct the Contractor to remedy and make good the defect, fault or omission by giving notice to the Contractor of the existence of the defect, fault or omission and the notice shall specify the time within which the defect, fault or omission is to be rectified and made good.

49.3 Specified Time. The Contractor shall rectify and make good the defect, fault or omission described in a notice given pursuant to subsection 49.2 within the time specified in the notice.

SECTION 3 - ROADWAY AND DRAINAGE EXCAVATION

1.0 DESCRIPTION

Roadway and Drainage Excavation shall consist of excavating, transporting or disposing of all materials taken from within the limits of the work except Borrow and other excavation not included in this specification. The work shall include all excavation necessary to construct or alter side ditches, off-take ditches, catch-water ditches and inlet or outlet ditches to drainage structures. The work shall also include the sloping and shaping necessary to prepare, alter, construct and complete embankments, shoulders, gutters, ditches, roadway and driveway intersections to the required alignment, grade and typical cross-sections shown as on the Plans or as directed by the Engineer.

2.0 REFERENCES

All reference standards shall be current issue or latest revision at the first date of tender advertisement. This specification refers to the following standards, specifications or publications:

- Division 2 Section 5, Borrow
- Division 2 Section 4, Disposal of Surplus Material
- Drawing HS201.DWG
- Drawing HS202.DWG

3.0 SUBMISSIONS AND DESIGN REQUIREMENTS

4.0 MATERIALS

5.0 CONSTRUCTION METHODS

5.1 General. All suitable materials removed from the excavation shall be used as far as practicable in the construction of embankments as directed by the Engineer. All breakage and slides shall be removed by the Contractor and disposed of as directed. Ditches and waterways shall be excavated to the depth, width and grade as shown on the plans or as directed by the Engineer. No excavated material shall be wasted without the approval of the Engineer. When material is to be wasted it shall be disposed of as approved by the Engineer. During construction the ditches shall be maintained in such condition that the roadway will be well drained at all times.

5.2 Solid Rock Excavation. Solid Rock excavation shall consist of excavating and removing rock insitu and all Boulders measuring 1 m^3 or greater in volume. Subsurface boulders 1 m^3 or greater in volume are classified as Solid Rock and this quantity shall be deducted from the Common Excavation quantity.

No undrained pockets shall be left in the rock surface. A material satisfactory to the Engineer shall be used to backfill the roadway to the subgrade elevation. All loose or shattered fragments of rock shall be removed from the roadway slopes. Excavated rock or waste from the excavation shall not be left outside the tops of the roadway slopes. Where depth permits, Solid Rock Excavation shall be used to construct embankments, otherwise it shall be disposed of as approved by the Engineer.

5.3 Swamp Excavation. Swamp Excavation shall consist of the excavation and disposal of peat, black muck or humus encountered in swamp or marsh areas.

If approved by the Engineer, excavated swamp material may be disposed of within the right-of-way. Such material shall be trimmed and left in a neat condition to the approval of the Engineer. Backfill on the areas from which Swamp Excavation has been carried out shall consist of approved material, and such backfilling shall follow excavation operations as directed by the Engineer.

It shall be the responsibility of the Contractor to ensure that the full depth of swamp is removed. In the event that the Department questions whether or not all of the swamp material has been removed from beneath the roadway, the Department will arrange for a subsurface investigation (drilling) to be carried out in the disputed area(s). If the investigation indicates that swamp material remains beneath the roadway, the Contractor shall be responsible for locating and removing all remaining swamp material and properly re-establishing fill placement in the affected area(s) to the satisfaction of the Engineer, and at no cost to the Department. If the investigation indicates that no swamp material remains beneath the roadway, all costs associated with the investigation will be borne by the Department.

In the event that the Contractor disputes the quantities calculated (based on soundings), the Department will arrange for a subsurface investigation (drilling) to be carried out in the disputed area. If the investigation indicates that the quantity paid (based on soundings) is correct, all costs associated with the investigation shall be borne by the Contractor. If the investigation indicates that the pay quantity (based on soundings) is in error, the actual pay quantity will be negotiated accordingly and all costs associated with the investigation will be borne by the Department.

5.4 Common Excavation. All excavated material other than Solid Rock or Swamp Excavation shall be

classed as Common Excavation.

6.0 QUALITY CONTROL / QUALITY ASSURANCE

7.0 METHOD OF MEASUREMENT

7.1 General. The quantity to be paid for under this item shall be the number of cubic metres of excavated material as shown on the cross-section sheets between the original ground line, as cross-sectioned before grubbing operations have started, and the theoretical line.

The Contractor is required to excavate to within 0.5 m of the theoretical backslope line in order to be paid for the excavation. If the Contractor excavates beyond the theoretical line no additional payment will be made for this material excavated. If the Contractor excavates beyond the 0.5 m tolerance (measured horizontally) they may be required to replace this material at the discretion of the Engineer.

Within the limits to be surfaced, where rock excavation is required, the Contractor shall undercut the rock excavation to a depth of 0.5 m ± 0.1 m. No payment will be made for material excavated beyond 0.5 m below the subgrade elevation. If the Contractor excavates to within ± 0.1 m of this defined plane they will be paid to the defined plane. If the Contractor excavates beyond the defined plane no additional payment will be made for this material excavated.

7.2 Rock. Whenever Solid Rock is encountered the Contractor shall strip the area of earth within the slopes and notify the Engineer in order that proper measurements or cross-sections may be made. No allowance will be made for Solid Rock excavated before such measurements or cross-sections have been made.

7.3 Swamp Excavation. The depth of swamp excavation shall be determined by soundings taken before the swamp is excavated. All swamp material shall be removed from beneath the roadway embankment. The Department will make available for viewing by the Contractor data concerning soundings for swamps identified in the work. Unless otherwise directed by the Engineer the outer limit of the swamp excavation shall be bounded by a vertical line measured one half the distance between the two lines defined below:

- lines extending vertically to the bottom of the swamp from the point where the theoretical slope line meets the top of the swamp, and
- lines extending vertically to the top of the swamp from the point where the theoretical slope line meets the bottom of the swamp, as shown on drawings HS201 and HS202.

7.4 Other Common Excavation. On paving, repaving and upgrading contracts the quantities excavated shall be computed by the average end area method. The area to be used for the computations shall be the greater of:

- the area shown on the cross-section sheets between the original position of the ground line before the ditching operation started and the lines of the completed and accepted excavation.
- an area determined by the width of the excavation measured horizontally on the cross-section at grade level by 300 mm in depth.

8.0 BASIS OF PAYMENT

8.1 General. Roadway and Drainage Excavation will be paid for under one of the following three classes:

- Solid Rock Excavation
- Swamp Excavation
- Common Excavation

The volume of Roadway and Drainage Excavation measured as provided above will be paid for at the contract unit price bid for Solid Rock Excavation, Swamp Excavation or Common Excavation, as the case may be, which prices shall be full compensation for the excavation, hauling (exclusive of overhaul), the formation of embankments (exclusive of compaction), trimming of slopes, disposal of surplus and waste materials, preparation and completion of subgrade, shoulders and roadway, and the furnishing of all equipment, tools, labour and incidentals necessary to complete the work, except the displacement of swamp by blasting which will be paid for as Extra Work.

In rock and common excavations, no payment will be made for material excavated beyond the defined plane outside the theoretical slopes except as detailed in Division 2 Section 5 of these specifications. If the Contractor excavates to within ± 0.5 m (measured horizontally) of the theoretical line they will be paid to the theoretical line.

Payment for all swamp excavation quantities and associated work will be paid based on the theoretical cross sections and limits as detailed in Subsection 7.3. The quantities shall be calculated by the Engineer and agreed upon (in writing) by the Contractor prior to any work being performed at the location(s) involved. In the event that additional quantities of swamp excavation are encountered the Contractor shall immediately contact the Engineer. Work shall not progress until the additional quantities are approved by the Engineer.

8.2 Overhaul General. This item shall include the transportation of "Roadway and Drainage Excavation" to embankment sites or other selected points over distances exceeding and exclusive of the established free haul distance of 300 m. All costs up to the free haul distance shall be included in the contract unit price per cubic metre for the class of excavation involved.

Material taken from excavation and used in embankments and selected material, hauled a distance greater than 300 m, when so directed by the Engineer, shall be paid for at the Standard Overhaul Rates for excavation.

8.2.1 Designated Overhaul. It may be necessary to move selected "Roadway and Drainage Excavation" from a designated area to a designated embankment or other site as directed by the Engineer. In this instance overhaul beyond the 300 m free haul distance will be computed separately from cross sections taken before and after placement of the material. No allowance will be made for selected material moved before cross sections have been made.

Haul

300 - 599 m	600 - 899 m
900 - 1199 m	1200 - 1499 m
1500 - 1799 m	1800 - 3199 m
3200 - 4799 m	4800 - 6399 m

8.2.2 Ordinary Overhaul. After proper deduction has been made for material placed within the free haul distance and selected material if any, the quantity of embankment excavation placed beyond the free haul distance of 300 m shall be classified as overhaul and calculated by the Mass Diagram Method.

These distances shall be measured along the centre-line of the main roadway which is under construction and any additional haul due to circuitry of travel will not be considered.

9.0 WARRANTY

SECTION 7 - SHOULDERS

1.0 DESCRIPTION

Shoulders shall be built and compacted to the lines, grades and cross-sections as shown on the contract drawings or as directed by the Engineer.

2.0 REFERENCES

All reference standards shall be current issue or latest revision at the first date of tender advertisement. This specification refers to the following standards, specifications or publications:

- Division 3 Section 2, Gravel Type 1, 1S, 2 & M
- Division 3 Section 5, Compaction of Gravels

3.0 SUBMISSIONS AND DESIGN REQUIREMENTS

4.0 MATERIALS

Gravel for shoulders shall be Type 1S as detailed in Division 3 Section 2 or as approved by the Engineer.

5.0 CONSTRUCTION METHODS

Gravels shall be applied directly to the shoulders by means of an approved side delivery shoulder spreader. Spreading or placing by end dumping of gravels on the pavement shall not be permitted.

Compaction of gravel for shoulders shall be as detailed in Division 3 Section 5 or as approved by the Engineer.

Where the roadway is open to the public the gravelling of shoulders shall not fall behind the paving/repaving operation by more than 3 days or 5 km. At the end of the working week shouldering shall be within 3 km of the paving. Where the roadway is not open to the public the time and distance constraints noted above shall not apply unless directed by the Engineer

6.0 QUALITY CONTROL / QUALITY ASSURANCE

7.0 METHOD OF MEASUREMENT

8.0 BASIS OF PAYMENT

The work described under this section will not be paid for directly but shall be included in the basis of payment items pertaining to Division 3 Section 2. Any material placed in Shoulders in excess of the quantities required will not be paid for and shall be removed at the Contractor's expense.

9.0 WARRANTY

SECTION 8 - COMPACTION

1.0 DESCRIPTION

Compaction is the work involved in consolidating to specified density material as placed in embankments and also that material at the top of subgrade in areas of excavation. The subgrade shall conform with the lines, grades, and cross-sections shown on the plans, or as directed by the Engineer after specified density has been obtained.

2.0 REFERENCES

All reference standards shall be current issue or latest revision at the first date of tender advertisement. This specification refers to the following standards, specifications or publications:

- ASTM D 698, Standard Proctor Test
- Division 2 Section 9, Water for Compaction & Dust Control

3.0 SUBMISSIONS AND DESIGN STANDARDS

4.0 MATERIALS

5.0 CONSTRUCTION METHODS

All material placed in subgrade shall be spread and bladed smooth in successive uniform layers, not to exceed 200 mm in compacted depth to the full width of the cross-section. Layers greater than 200 mm may be permitted by the Engineer providing specified density is obtained.

Embankments constructed principally of rock shall be placed in successive uniform loose layers not exceeding in depth the approximate average size of the larger rock, but limited to a maximum of 1 m. The maximum dimension of rock placed in the embankments shall not exceed 1 m. The rock shall not be dumped in place, but shall be distributed by suitable means within the embankment such that the interstices around the rock are filled with fine material.

Each layer shall be compacted to a minimum of 95% of the Standard Proctor dry density or the applicable Control Strip Density. The upper 300 mm of the subgrade shall be compacted in 150 mm layers to a minimum of 98% of the Standard Proctor dry density or the Control Strip Density. Unless otherwise approved by the Engineer, moisture content of the material shall be within ± 2% of its optimum moisture content as determined by Standard Proctor Density test.

Sidehill embankments may be constructed by dumping successive loads in uniformly distributed layers until the embankment is wide enough to permit the use of compaction equipment, after which the remainder of the embankment shall be compacted as specified.

When the original ground will not support the weight of the compaction equipment, the lower part of the embankment may be constructed by dumping successive loads in uniformly distributed layers of a thickness not greater than that necessary to support the equipment, after which the remainder of the embankment shall be compacted as specified.

5.1 Test Methods. All testing to ensure conformance to specification requirements shall be carried out by the Engineer or representative.

For material containing less than 30% oversize (retained on 20 mm sieve) the test method shall be Standard Proctor Test - ASTM D 698.

The maximum dry density for material containing more than 30% oversize shall be determined using the method prescribed herein as "Control Strip".

5.2 Control Strip Method. A Control Strip is a lift of material constructed on a 200 m section, minimum 3 m wide, of prepared surface selected by the Engineer. A maximum dry density, "Control density", shall be is established on the lift of material using the equipment and method of compaction as prescribed herein for construction of a Control Strip.

A Control Strip shall be constructed at the beginning of work. One or more Control Strips shall be constructed for each lift placed and also when any change in the character of the material, or any change in the compaction equipment used occurs. Each Control Strip is to remain in place and become a portion of the completed embankment.

To determine the Control Density, a minimum of six moisture and density tests shall be taken at random locations by the Engineer or representative, using a nuclear moisture density gauge. Test results shall be averaged to determine the in-place maximum dry density.

The maximum compacted thickness of each layer shall not exceed 200 mm except when it can be demonstrated, in construction of the Control Strip, that adequate compaction of thicker lifts is possible. The Control Density of lifts greater than 200 mm shall be

equal to or greater than the Control Density of 200 mm layers. No additional lifts shall be placed until the control density is determined and required compaction is attained.

The Control Strip moisture content shall be adjusted to produce necessary compaction as directed by the Engineer. If the Control Strip compaction is being adversely affected by the moisture content of the soil, being either excessive or deficient, the Control Strip construction shall not continue until the moisture content is reduced or increased, to produce necessary compaction.

The type and mass of the compaction equipment used shall be such that uniform density is obtained throughout the depth of the layer being compacted. Minimum compaction equipment shall be vibratory steel rollers weighing not less than 6 t each and having a vibratory capacity of at least 1500 VPM with a minimum dynamic or centrifugal force of 8000 kg, operated in the vibratory mode, and at a speed not exceeding 8 km/h.

5.2.1 Control Density Determination. A lift of material shall be spread over the entire Control Strip section. Once the Control Strip lift has been completely spread, the measurements for the Control Density shall commence and continue during repeated passes of the compaction equipment until a maximum dry density is achieved.

A "Pass" is defined as one complete coverage of the Control Strip layer with the compaction equipment. Testing of the Control Strip shall be discontinued when the average dry density between each series of passes:

- increases by less than 10 kg/m^3
- continually decreases, or
- remains constant.

This maximum dry density shall be the Control Density used to determine the percent compaction in other areas of the project of the same lift and thickness and of the same material as that used in the Control Section.

6.0 QUALITY CONTROL / QUALITY ASSURANCE

7.0 METHOD OF MEASUREMENT

The quantity of compaction shall be the number of cubic metres of compacted material placed and accepted in embankments computed using the average end area method of computation. The Contractor shall be required to place and compact material to within 0.5 m of the theoretical embankment lines. If the Contractor places and compacts material beyond the theoretical embankment lines no additional payment will be made for this material. If the Contractor places and compacts material beyond the 0.5 m tolerance they may be required to remove this material at their own cost. The quantity of compaction in areas of excavation, where compaction of the top of the subgrade material is undertaken, shall be calculated based on the width multiplied by 300 mm depth below the top of the subgrade.

8.0 BASIS OF PAYMENT

The quantity of compaction as specified above, will be paid for at the contract unit price bid for compaction which price shall be full compensation for the work described in this section including the furnishing of all equipment, labour, materials and incidentals necessary to complete the work. If the Contractor places and compacts material to within ± 0.5 m (measured horizontally) of the theoretical line they will be paid to the theoretical embankment lines. No payment will be made for material placed and compacted beyond the theoretical slopes.

When Common or Borrow material is placed in and across a body of water for the purpose of subgrade construction, no payment will be made for compaction of any materials lying below the surface of the water at the time the embankment is constructed.

9.0 WARRANTY

SECTION 12 - FOUNDATION EXCAVATION

1.0 DESCRIPTION

Foundation Excavation shall consist of the removal of material for the construction of culverts, farm crossings and the laying of pipe, catch basins and retaining walls.

2.0 REFERENCES

All reference standards shall be current issue or latest revision at the first date of tender advertisement. This specification refers to the following standards, specifications or publications:

- Division 2 Section 4, Disposal of Surplus Material
- Division 5, Section 12 Underground Drainage Structures
- Drawing HS203.DWG
- Drawing HS528.DWG

3.0 SUBMISSIONS AND DESIGN REQUIREMENTS

4.0 MATERIALS

5.0 CONSTRUCTION METHODS

Foundation Excavation shall conform to the lines and grades shown on the plans or as directed by the Engineer.

Boulders measuring 0.25 m^3 or greater, all rock insitu and masonry of old structures shall be classed as Foundation Excavation Solid Rock. All other excavated materials shall be classed as Foundation Excavation Common. The materials, so removed, shall be satisfactorily utilized or disposed of as directed by the Engineer.

After the excavation has been completed the Contractor shall notify the Engineer and no bedding material, masonry, pipe or other material shall be placed in the excavated area until the Engineer has approved the lines and grades of the excavation and character of the foundation material.

Where any structure including farm crossings, driveway culverts and roadway culverts etc., are to be installed and when sufficient excavation has been carried out during grading operations, Foundation Excavation will not be allowed but the excavation will be classified as Roadway and Drainage Excavation. If additional excavation is required for installing any structure including farm crossings, driveway culverts and roadway culverts, etc., this additional excavation shall be classified as Foundation Excavation.

6.0 QUALITY CONTROL / QUALITY ASSURANCE

7.0 METHOD OF MEASUREMENT

All excavated material shall be measured in cubic metres in its original position provided such material has been satisfactorily utilized or disposed of as directed. The maximum limits for foundation excavation shall be as detailed in drawings HS203.DWG and HS528.DWG or as directed by the Engineer.

Measurement shall be based on the actual excavation carried out within the specified limits.

8.0 BASIS OF PAYMENT

The volume of Foundation Excavation measured as provided above will be paid for at the contract unit price bid per cubic metre for Foundation Excavation Common or Foundation Excavation Solid Rock, as the case may be. The volume of subsurface boulders paid as Foundation Excavation Solid Rock shall be deducted from the volume paid as Foundation Excavation Common. Payment shall be full compensation for the work described in this section, including all equipment, materials, labour, and incidentals necessary to complete the work.

9.0 WARRANTY

SECTION 2 - GRAVEL TYPE 1, 1S, 2 & M

1.0 DESCRIPTION

Gravel Type 1, Type 1S, Type 2 and Type M shall be composed of crushed and screened rock or gravel. The material shall be transported and placed upon the subgrade, subbase or shoulder and compacted as directed and in accordance with these specifications.

2.0 REFERENCES

All reference standards shall be current issue or latest revision at the first date of tender advertisement. This specification refers to the following standards, specifications or publications:

- ASTM C 117, Test Method for Material Finer Than 75 µm Sieve in Mineral Aggregate by Washing
- ASTM C 127, Test Method for Specific Gravity and Absorption of Coarse Aggregate
- ASTM C 136, Test Method for Sieve Analysis of Fine and Coarse Aggregate
- ASTM D 4318, Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils
- TPW TM-1, Test Method for the Resistance of Coarse Aggregate to Degradation in the Micro-Deval Apparatus
- TPW TM-3, Test Method for the Determination of Percent Fractured Particles in Processed Coarse Aggregate
- Division 1 Section 4, General Provisions
- Division 3 Section 5, Compaction of Gravels

3.0 SUBMISSIONS AND DESIGN REQUIREMENTS

4.0 MATERIALS

Gravel shall be composed of approved hard, durable stones and sand particles in conformance with this specification.

4.1 Gradation Requirements. The gravels shall be free from flat, elongated or other objectionable pieces and shall be approved by the Engineer prior to utilization. The gravels shall be tested in accordance with ASTM C 117 and C 136 and shall fulfil the gradation requirements detailed in Table 3.2.1.

Table 3.2.1 - Gradation

Sieve Size, µm	Percent Passing			
	Type 1	Type 1S	Type 2	Type M
80 000			100	
56 000			70 - 100	
28 000			50 - 80	100
20 000	100	100		85 - 100
14 000	50 - 85	50 - 85	35 - 65	70 - 95
5 000	20 - 50	30 - 55	20 - 50	30 - 60
1 250				15 - 35
160	5 - 12	7 - 20	5 - 12	5 - 12
80	3 - 8[1]	5 - 12[2]	0 - 7[1]	3 - 8

[1] For gravel sources not classified as quarries the allowable percentage passing the 80 µm sieve shall be 3 to 5%.
[2] Where percentages passing the 5000 µm sieve are between 30 and 45%, the allowable percentage passing the 80 µm sieve shall be 3 to 12%.

4.2 Fractured Particles Content. The gravel shall have a fractured particle content conforming to values listed in Table 3.2.2. The fractured particle shall have at least one well defined fresh face resulting from fracture, with the face comprising no less than 20% of the particle surface area. Particles with smooth faces and rounded edges, or with only small chips removed, are not considered fractured.

Table 3.2.2 - Fractured Particles

Gravel	Fractured Particles, one face, % min.	Test Method
Type 1[1]	80	TPW
Type 1[2]	50	TPW
Type 2 and 1S	50	TPW
Type M	40	TPW

(1) For highways with truck (FHWA Class 4 or above) traffic equal to or greater than 200 per day.
(2) For highways with less than 200 trucks (FHWA Class 4 or above) per day.

4.3 Physical Properties. Gravel materials shall conform to the physical properties listed in Table 3.2.3.

Table 3.2.3 - Physical Properties

Property	Test Method	Type 1	Type 1S	Type 2	Type M
Absorption % max.	ASTM C 127	1.75	1.75	1.75	2.00
LA Abrasion % max.	ASTM C 131	40	40	40	40
Plasticity Index max.	ASTM D 4318	0	0	0	3
Micro-Deval % max.	TPW	20	35	20	30

5.0 CONSTRUCTION METHODS

Crushing, screening and transporting of materials shall be performed by such methods so that a uniform grade of material shall be placed on the roadbed. Screening shall be done with vibrating or rotary screens to eliminate all objectionable material such as earth, sod, foreign vegetable matter, clay or any excess of silt in the gravel. Prior to the placement of Gravel Type 2 or Type 1, the existing subgrade or subbase shall be shaped to the required cross-section to the approval of the Engineer.

Gravels Type 1, Type 1S and Type 2 shall be compacted as specified in Division 3 Section 5 and shall be shaped with a blade grader while being compacted. The shaping of the material shall be continued until it is well compacted, free from ruts, waves and undulations. The final authorized cross-section shall conform to the established grades within a tolerance of ± 25 mm for Gravel Type 2 and ± 10 mm for Gravel Type 1 but not uniformly high or low.

Gravel Type M is intended for use by maintenance personnel as a surface course or general maintenance material.

Stockpiles shall be built in layers not to exceed 1 m in depth. Each layer shall be completed before beginning the next layer. Aggregates delivered to the stockpile in trucks shall be uniformly spot-dumped and the stockpile built as specified above. Coning of stockpiles shall not be permitted.

5.1 Inspection. The Department will have a representative at the site of gravel production. The Contractor is responsible to provide free and safe access to the site to permit the Department's representative to carried out required duties.

The Contractor shall supply an inspection facility at the gravel production site for the Department's representative and at the Contractor's expense. The location of this facility shall be close to the production site which allows a clear view of the operation and shall be in an environmentally acceptable area. At the gravel production site, a reservoir of 100 L. of water suitable for performing tests shall be supplied.

5.1.1 Inspection Quarters - Aggregate Production Facility.

- outside dimension 2 m x 2 m minimum
- one door
- one window
- one bench
- one chair
- supply of water for testing purposes
- source of heat and/or light (if required)

6.0 QUALITY CONTROL / QUALITY ASSURANCE

7.0 METHOD OF MEASUREMENT

The Contractor shall, at their own expense, provide, install and maintain such approved scales and all suitable facilities as detailed in Division 1 Section 4 Subsection 38.

The quantity of Gravels Type 1, Type 1S, Type 2 and Type M placed in stockpile as indicated above, will be estimated by the Engineer.

8.0 BASIS OF PAYMENT

Gravels Type 1, Type 1S, Type 2 and Type M will be paid for at the contract unit price per tonne for Gravels. The price shall be full compensation for furnishing all materials, equipment, and labour required to carry out the handling, hauling, placing and compacting of the Gravels as well as any incidentals necessary to complete the work.

Gravels Type 1, Type 1S, Type 2 and Type M placed in stockpile as indicated above will be paid for at the current rate as indicated in Appendix C.
When such materials in stockpile have been placed on the highway the Contractor shall be paid at the unit

price bid for such materials and the payments for such materials in stockpile shall be deducted and shown as a minus quantity on the estimate sheet. Any gravel left in stockpile and not used on the highway will not be paid for and shall remain the property of the Contractor.

The Contractor may be paid for gravels in stockpile when such materials cannot be placed on the highway within a period of two months from the date of commencement of crushing such material.

9.0 WARRANTY

SECTION 1 - EMULSIFIED ASPHALT

1.0 DESCRIPTION

The Contractor shall, where directed, supply, transport and apply emulsified asphalt upon the existing asphalt concrete base or a prepared or primed surface prior to the application of asphalt concrete or graded aggregate. The Contractor shall also, where directed, supply, transport and add emulsified asphalt to Recycled Asphalt Concrete to rejuvenate the mix.

2.0 REFERENCES

All reference standards shall be current issue or latest revision at the first date of tender advertisement. This specification refers to the following standards, specifications or publications:

- ASTM D 140, Practice for Sampling Bituminous Materials
- ASTM D 244, Test Methods for Emulsified Asphalts
- Seal Coat and Surface Treatment Construction and Design Using Asphalt Emulsions, Dr N MacLeod
- Recommended Performance Guidelines, AEMA

3.0 SUBMISSIONS AND DESIGN REQUIREMENTS

3.1 Source of Supply. The Contractor shall only purchase emulsified asphalt from suppliers whose emulsion plants have been approved by the Department.

3.2 Notice of Supply. Bidders shall nominate their source of emulsified asphalt as a supplement to the tender. On the form "Statement of Asphalt Cement, Liquid Asphalt-Primer and Emulsified Asphalt-Tack" Bidders shall be required to submit with their tender a statement as to the source (emulsion plant) of emulsified asphalt. The Bidder shall only nominate one source of supply of emulsified asphalt.

No tender will be considered that does not include the above information.

The Contractor is hereby advised that if the source (emulsion plant) they nominate has not been approved by the Department, then it shall be a requirement that the emulsion plant receive approval before any emulsified asphalt can be used on a Department project. In the event that the Contractor wishes to change their source of supply during the progress of the contract, the change shall be approved in writing by the District Director before the alternate source can be used.

4.0 MATERIALS

4.1 Emulsified Asphalts. These products shall conform to the specifications for RS-1, HF-150S, CRS-2 and SS-1 as detailed in Table 4.1.1 and CRS-2P and HP-200 as detailed in Table 4.1.2.

5.0 CONSTRUCTION METHODS

5.1 General. When applying emulsions, the Contractor shall cover concrete walks, curbs, walls and adjacent surfaces along the highway with paper or other satisfactory covering and shall remove all emulsified asphalt which adheres to the concrete. No additional compensation will be allowed the Contractor for this work. Any accidental spills or any material that runs off the road surface shall be cleaned up immediately.

Emulsified asphalt shall only be applied to dry surfaces.

5.2 Application of Tack Coat. The Contractor shall clean surfaces to be tacked by means of a rotary power broom or hand brooms to remove all dirt, sand, dust or other objectionable matter. The Contractor shall apply a uniform cover of the RS-1 emulsion with a distributor at a rate of 140 ml/m^2, or as directed by the Engineer, and at a temperature not less than 20°C nor more than 70°C. Hot mix shall not be placed upon the tack coated areas until the tack coat has dried to a condition of tackiness. No more tack coat shall be applied than can be covered with asphalt concrete wearing surface in any one day.

5.3 Application of Emulsified Asphalt for Type B - Double Seal Coat over Gravel/Sand Seal. The Contractor shall sweep or compact the primed gravel surface or sweep the sand seal surface as deemed necessary. Sweeping shall be done by means of a rotary power broom to remove all dirt, sand, dust or other objectionable matter. The Contractor shall apply a uniform cover of the emulsified asphalt with a distributor.

The Contractor shall determine the rate of application of the emulsified asphalt utilizing SC-3 initial course and SC-2 finial course gradations specified in Division 4 Section 12, taking into consideration such variables as the texture and absorbency of the surface, traffic density and other pertinent factors, as outlined in "Seal Coat and Surface Treatment Construction and Design Using Asphalt Emulsions", by Dr. Norman McLeod and "Recommended Performance Guidelines", by the Asphalt Emulsion Manufacturers Association.

Table 4.1.1 Physical Requirements of Emulsified Asphalt

Requirements	Rapid Setting Emulsified Asphalt: RS-1		High-Float Emulsified Asphalt: HF-150S		Rapid Setting Cationic Emulsified Asphalt: CRS-2 (RS-2K)		Slow Setting Emulsified Asphalt: SS-1	
	Min	Max	Min	Max	Min	Max	Min	Max
Saybolt Viscosity[1], S	20	100					20	60
Saybolt Viscosity [2],S			35	150	150	400		
Residue[3], %	55	--	62	--	68	--	55	--
Storage Stability [4], %	--	1.5	--	1.5	--	1	--	1.5
Sieve Test[5], %	--	0.1	--	0.1	--	0.1	--	0.1
Demulsibility [6] ,%	60	--						
Demulsibility[7], %			75	--				
Particle Charge[8]	Negative		Negative		Positive		Negative	
Oil Portion[9]			0.5	4	--	3		
App Viscosity[11], Pa.s			90	3000				
Float Test[12], S			1200	--				
Solubility[13], %			97.5	--			97.5	--
Settlement in 5d[14], %					--	5		
Ductility [15], cm							60	--
Cement Mixing Test[16], %							--	2.0
Tests on Residue								
Penetration[17], 0.1 mm	100	200	150	250	100	250	100	200
Ductility[15], cm	60	--			60	--		
Solubility[13], %	97.5	--			97.5	--		

(1) ASTM D 244, tested at 25°C using a Furol orifice.
(2) ASTM D 244, tested at 50°C using a Furol orifice.
(3) ASTM D 244, residue from distillation and expressed as % by mass.
(4) ASTM D 244, tested in 24 hrs and expressed as % by mass.
(5) ASTM D 244, % by mass retained on a 1000 sieve.
(6) ASTM D 244, using 35 ml of 1.11 g/L $CaCl_2$ and expressed as % by mass.
(7) ASTM D 244, using 50 ml of 5.55 g/L $CaCl_2$ and expressed as % by mass.
(8) ASTM D 244, tested using 12V direct current and expressed as negative (anionic) or positive (cationic) charge.
(9) ASTM D 244, oil portion of residue from distillation and expressed as % by mass.
(10) ASTM D 244 and D 5 at 25°C, 100 g and 5s.
(11) ASTM D 244 and D 2171, tested at 60°C.
(12) ASTM D 244 and D 139, tested at 60°C.
(13) ASTM D 244 and D 2042 using trichloroethylene and expressed as % by mass.
(14) ASTM D 244, % by mass. The test requirement for settlement may be waived when the emulsified asphalt is used in less than 5 d time.
(15) ASTM D 244 and D 113 at 25°C and 5 cm/min.
(16) ASTM D 244 expressed as % by mass.
(17) ASTM D 244 and D 5 at 25°C, 100 g and 5s.

Table 4.1.2 Physical Requirements of Emulsified Asphalt

Requirements	Polymer-Modified Emulsified Asphalt: CRS-2P		Requirements	Emulsified Asphalt: HP-200	
	Min	Max		Min	Max
Saybolt Viscosity[1], SFs	75	400	Saybolt Viscosity [1],SFs	50	250
Residue[2], % by Mass	65	–	Residue[2], % by Mass	85	–
Settlement[3], 24 hours, %	–	1	Settlement in 5d[3], %		3
Demulsibility[4], %	40	–			
Oil Portion of Distillate[5], % by Vol. of Emulsion	–	3			
Sieve Test[6], % by Mass	–	0.20	Sieve Test[4], % by Mass		0.10
Particle Charge[7]	Positive		Particle Charge[5]	Negative	
Tests on Residue					
Penetration[8], 0.1 mm	100	250	Penetration[6], 0.1 mm	100	250
Solubility[9], %	97.5	–	Ductility[7], cm	40	–
Ash Content[10], % by Mass of Residue	–	1.0	Solubility[8], %	97.5	1.0
Elastic Recovery, @ 10°C, %	55	–			
Spraying Temperature °C	65	80	Spraying Temperature °C	65	80

Polymer Modified Emulsified Asphalt, CRS-2P:

(1) ASTM D 244, tested at 50°C using Furol orifice.
(2) ASTM D 244, residue from distillation to 204.4°C.
(3) ASTM D 244, % by mass.
(4) ASTM D 244, using 35 mL Dioctyl Sodium Sulfosuccinate Solution (0.8%).
(5) ASTM D 244
(6) ASTM D 244, % by mass retained on 1000 sieve.
(7) ASTM D 244, tested using a 12V direct current and expressed as positive (cationic) charge.
(8) ASTM D 244, D5 at 25°C and 100 g in 5s.
(9) ASTM D 244, D2402 using trichlorethylene and expressed as % by mass.
(10) ASTM D 2415, the ash content shall be determined when the manufacturer indicates that the polymer additive is not soluble in trichlorethylene.

Emulsified Asphalt, HP-200:

(1) ASTM D 244, tested at 50°C using a Furol orifice.
(2) ASTM D 244, residue from distillation and expressed as % by mass.
(3) ASTM D 244, % by mass. The test requirement for settlement may be waived when the emulsified asphalt is used in less than 5 d time.
(4) ASTM D 244, % by mass retained on a 1000 sieve.
(5) ASTM D 244, tested using 12V direct current and expressed as negative (anionic) charge.
(6) ASTM D 244 and D 5 at 25°C, 100 g and 5s.
(7) ASTM D 244 and D 113 at 25°C and 5 cm/min.
(8) ASTM D 244 and D 2042 using trichloroethylene and expressed as % by mass.

5.4 Application of Emulsified Asphalt for Type A - Single Seal Coat over Reclaimed Asphalt Concrete/Sand Seal/Chip Seal. The Contractor shall sweep the reclaimed asphalt concrete, sand seal or chip seal surface by means of a rotary power broom to remove all dirt, sand, dust or other objectionable matter deemed necessary by the Engineer. The Contractor shall apply a uniform cover of the emulsified asphalt with a distributor.

The Contractor shall determine the rate of application of the emulsified asphalt utilizing SC-2 grading specified in Division 4 Section 12, taking into consideration such variables as the texture and absorbency of the surface, traffic density and other pertinent factors, as outlined in "Seal Coat and Surface Treatment Construction and Design Using Asphalt Emulsions", by Dr. Norman McLeod and "Recommended Performance Guidelines", by the Asphalt Emulsion Manufacturers Association.

5.5 Application of Polymer-Modified Emulsified Asphalt for Type A - Single Seal Coat over Asphalt Concrete. The Contractor shall sweep the asphalt concrete surface by means of a rotary power broom to remove all dirt, sand, dust or other objectionable matter, when deemed necessary by the Engineer. The Contractor shall then uniformly apply the polymer-modified emulsified asphalt with a distributor.

The Contractor shall determine the rate of application of the polymer-modified emulsified asphalt utilizing SS-1 grading specified in Division 4 Section 12, taking into consideration such variables as the texture and absorbency of the surface, traffic density and other pertinent factors, as outlined in "Seal Coat and Surface Treatment Construction and Design Using Asphalt Emulsions", by Dr. Norman McLeod and "Recommended Performance Guidelines", by the Asphalt Emulsion Manufacturers Association.

5.6 Application of Emulsified Asphalt for Reclaimed Asphalt Paving. The Contractor shall add a precisely metered amount of emulsified asphalt to the RAC material using a Midland Paver, or an approved equivalent. Approximately 4.5 L/m^2 of SS-1 emulsion per 90 mm of RAC thickness is required, however, field adjustments in the application rate may have to be made by the Contractor depending on the gradation of the reclaimed material.

5.7 Pressure Distributor. The pressure distributor referred to in Subsections 5.1 to 5.4 shall be a self-powered pressure asphalt distributor, capable of applying the emulsified asphalt uniformly, at the established rate, in one application, over the full required width. It shall consist of a fully insulated tank, permanently and rigidly mounted on a truck or trailer, capable of accurately maintaining any speed required for spraying.

The distributor shall be provided with the following minimum equipment:

- Proper hand spray attachments to uniformly apply emulsion to any areas missed by the distributor.
- An efficient and positive means of heating the emulsified asphalt uniformly to any selected temperature up to 100°C, and maintaining the contents constantly at this temperature without any local overheating and including a satisfactory method of circulating the contents during the entire heating process.
- An approved thermometer with a minimum range of 10°C to 100°C, graduated in intervals of not more than 10°C, so placed as to accurately show the temperature of the distributor contents, and to be accessible to the Engineer.
  An approved tachometer, driven from a fifth wheel, mounted so that it is readily visible to the driver so that it clearly and accurately registers distances traveled when spraying emulsion, and so that it enables the driver to maintain a constant speed required to ensure the specified rate of application of the emulsion.
- A pump tachometer which registers pump output within 3%.
- A pressure gauge indicating the pressure in the spray bar within 15 kPa.
- A rear mounted spray bar set parallel to the surface to be sprayed, and capable of adjustment to provide any required spraying widths from 2.5 m to 3.5 m. The distributor shall be equipped with a spray bar heating and circulating device, to ensure uniform viscosity and pressure of the emulsified asphalt at each nozzle, both before and during spraying operations. The spray bar shall be provided with a positive shut-off to prevent dripping.

The circulating system shall also be provided with a strainer to prevent clogging of the bar and nozzles. The spray bar height shall be adjustable and shall be set at such a height that the spray fan from any nozzle overlaps the spray fan from the adjacent nozzle by two-thirds for triple-lap so that a uniformly sprayed surface will result. This height shall be set when the distributor is one-half full, and shall be changed only when permitted by the Engineer.

Spray bar nozzles shall be designed and set so as to ensure uniform fan shaped sprays. The nozzles shall not be set so as to produce such a fine mist that the emulsified asphalt will blow away and not provide an even spread. All spray nozzles shall be of the same manufacture, size, type and in good condition and shall be provided with valves capable of instant full opening and positive cut-off. All spray nozzles shall be set in the bar so that the nozzle slots make the same horizontal angle (30°) with the longitudinal axis of the bar. Before work commences, and periodically as

required during spraying operations, the nozzles on the spray bar shall be removed, cleaned sufficiently to remove all congealed asphalt and to free the nozzle opening. Each nozzle shall be inspected and approved by the Engineer and reinstalled on the spray bar at the correct angle.

A strainer shall be provided in the filling line to prevent entry of foreign material into the tank.

A sampling cock shall be fitted on the spray bar or circulating line, and shall be readily accessible to allow samples of the emulsion to be obtained directly from the distributor.

The distributor shall be checked for calibration by the Engineer before being used on the work.

An alternate means of application may be permitted for small or isolated areas at the discretion and approval of the Engineer.

6.0 QUALITY CONTROL / QUALITY ASSURANCE

The emulsified asphalt from each tanker shall be sampled in accordance with ASTM D 140 by the Department or its representatives and shall conform to the requirements as follows except when a modified emulsified asphalt is required it shall conform to the Special Provisions.

Any contamination of the emulsified asphalt and/or deviation from this specification shall be corrected to the satisfaction of the Engineer and at no cost to the Department.

Such deficiencies may be noted from samples of emulsified asphalt taken by representatives of the Department. Any necessary remedial measures shall be done by the Contractor at no expense to the Department and to the satisfaction of the Engineer.

6.1 Notification of Deliveries. To ensure that the Department has someone available to carry out sampling the Contractor shall notify the Engineer of the approximate time of delivery of all loads. For loads that are to be delivered after 5:00 p.m. on normal work days, the Contractor shall give the Engineer notification prior to 4:00 p.m. on the day of the delivery. Notification of weekend deliveries shall be given to the Engineer before 4:00 p.m. on Friday.

7.0 METHOD OF MEASUREMENT

The volume of emulsified asphalt shall be calculated at a temperature of 15°C.

8.0 BASIS OF PAYMENT

The emulsified asphalt will be paid for at the contract unit price per litre or kilolitre in place, which price shall be full compensation for supplying, cleaning the surface before application, heating, handling, transporting, and applying of this material and the furnishing of all equipment, and labour incidental to the work.

9.0 WARRANTY

SECTION 2 - PERFORMANCE GRADED ASPHALT BINDER (PGAB)

1.0 DESCRIPTION

This item shall include the supply and transportation of various grades of Performance Graded Asphalt Binder (PGAB) to the Contractor's plant that is used in the manufacture of asphalt concrete and is accepted in place.

Performance Graded Asphalt Binder (PGAB): means an asphalt binder which is an asphalt-based cement that is produced from petroleum residue either with or without the addition of non-particulate organic modifiers.

Quality Control (QC) and Quality Assurance (QA) procedures are described herein. The Contractor shall be responsible to submit the QC test results and to ensure that all materials meet specification.

Initial acceptance of PGAB shall be based on samples taken and tested by the supplier's designated laboratory, subject to the conditions detailed in this specification.

To determine final acceptance of the product, the Department will conduct QA testing to confirm test results supplied by the Contractor by testing random samples taken from the Contractors' binder storage tank(s) located at the hot mix plant.

2.0 REFERENCES

All reference standards shall be current issue or latest revision at the first date of tender advertisement. This specification refers to the following standards, specifications or publications:

- AASHTO MP1, Standard Specification for Performance Graded Asphalt Binder
- AASHTO PP6, Standard Practice for Grading or Verifying the Performance Grade of an Asphalt Binder
- ASTM D 140, Practice for Sampling Bituminous Materials
- ASTM D 3665, Standard Practice for Random Sampling of Construction Materials

3.0 SUBMISSIONS AND DESIGN REQUIREMENTS

3.1 Notice of Supply. Bidders shall nominate their source of PGAB and provide a Statement of Supplier's price for PGAB as a supplement to the tender. On the form "Statement of PGAB, Liquid Asphalt-Primer and Emulsified Asphalt-Tack", Bidders shall:

- Submit with their tender a statement as to the source of PGAB. The Bidder shall only nominate one source of supply of PGAB. The Supplier must be on the Department's list of approved supplier's.
- Indicate the Supplier's Posted Rack Price for PGAB FOB refinery (excluding taxes). For confirmation, the Bidder shall attach the written price quotation from the Supplier, which price shall be effective at time of award of contract and shall remain in effect until the end of the current calendar year.

No tender shall be considered that does not include the above information.

3.2 Contracts Completed In Calendar Year. In the event that the Contractor wishes to change the source of supply during the progress of the contract, the Contractor shall apply for approval, in writing, to the District Director. Approval in writing must be given by the District Director before the source of supply is changed.

The Contractor shall not be compensated for any increase in the cost of PGAB in the calendar year in which the asphalt work was initially intended to be done.

3.3 Contracts Carried Over To The Next Calendar Year. In the event the Supplier's Posted Rack Price increases or decreases subsequent to the end of the calendar year in which the asphalt work was initially scheduled and one of the following conditions is satisfied, then a price increase or decrease will be considered:

- In the opinion of the Department, a delay caused by another Contractor working on the contract site adversely affects the start-up date of the Contract resulting in the completion of paving being delayed until the following year; or
- In the opinion of the Department, the lateness in tender call makes it unreasonable for the Contractor to finish asphalt work that year. This will be noted in the Special Provisions of the contract; or
- In the opinion of the Department, for reason(s) beyond the control of the Contractor, the work could not be completed before the end of the calendar year in which the work was initially intended to be completed.

If the request for a price increase or decrease is approved by the District Director the Contractor will be assessed an increase or decrease for an amount equal to the actual dollar difference between the Supplier's

original Posted Rack Price quotation and the Supplier's new Posted Rack Price for PGAB. In all cases the Supplier's Posted Rack Price quotation for the price of PGAB for the next calendar year shall be submitted to the Engineer before the Contractor will be paid for any PGAB used that year. Any claim for a price difference by the Contractor shall be supported by the Supplier's invoice.

4.0 MATERIALS

4.1 Physical Requirements. The PGAB as outlined in Table 4.1.1 shall conform (**with or without liquid anti-stripping additive,** or other approved additives) to the requirements of AASHTO Provisional Standard MP1 for the performance grade specified in the Contract when tested using the methods designated in AASHTO Provisional Standard PP6.

4.2 General Requirements. The PGAB shall be homogeneous, free of water and any contamination and shall not foam when heated to the temperatures specified by the manufacturer for the safe handling and use of the product.

4.3 Approved Suppliers. PGAB shall be obtained from a Supplier approved by the Department. Approved Suppliers will be identified in the Contract Special Provisions.

5.0 CONSTRUCTION METHODS

5.1 Tankers, Storage Tanks. Tankers used to transport PGAB and PGAB storage tanks located at asphalt concrete mixing plants shall meet the following requirements:

- Be free from hydrocarbon fuels or solvents, such as gasoline, diesel, varsol, gasoline, etc.
- Have a sampling spigot as outlined in ASTM D 140.
- Be equipped with thermometers, accurate and capable of reading to the nearest 2°C.

6.0 QUALITY CONTROL / QUALITY ASSURANCE

6.1 PGAB Documentation. For each grade of PGAB specified in the Contract, the Contractor shall supply the current test result data to the Project Engineer prior to the first use of the product(s). The product shall have been graded by conducting the required tests of the "Test Procedure for Verifying the Nominal Grade of an Asphalt Binder" of AASHTO Provisional Standard PP6, Section 7.

The Contractor shall provide the applicable mixing and laboratory compaction temperatures for each product, and documentation of construction, storage and handling requirements, including the material safety data sheet, laboratory recompaction temperature, mix discharge temperature and recommended extraction procedure.

6.2 Laboratory Proficiency. The laboratory conducting the QC testing shall have participated in the most recent AASHTO proficiency sample correlation program for PGAB, and shall have obtained proficiency ratings in the program satisfactory to the Department. Alternatively, the laboratory shall have satisfactorily participated in any equivalent correlation program acceptable to the Department. Documentation of the laboratory's participation and proficiency shall be provided to the Department upon request.

6.3 Anti-Stripping Additive. When a liquid anti-stripping agent is to be incorporated into the mix, samples of PGAB for QC or QA are to be taken after the anti-stripping agent has been added to the PGAB.

6.4 Samples for Testing. All QA samples shall be a minimum size of one litre and shall be taken from the Contractor's storage tank in accordance with ASTM D 140 by the Contractor. An additional set-aside sample shall be taken by the Contractor in the event an appeal test is required. The random number information pertaining to the hot mix tonnage at which the PGAB is required to be sampled shall be supplied by the Department.

The Department will verify the sampling, package and transport all samples (including set-aside samples) for QA testing.

7.0 QUALITY CONTROL

7.1 Quality Control Plan. The Contractor shall provide a QC Plan to the Project Engineer detailing the quality control activities related to the use of PGAB. A supplier's QC Plan may be used for this purpose, provided that specific storage/handling details, etc. are furnished by the Contractor. The QC Plan shall be submitted within seven calendar days prior to the first use of the product(s). Hot mix production shall not commence until the QC Plan is accepted by to the Department.

As a minimum, the QC Plan shall provide the following information:

- The type of facility from which the product(s) will be supplied (refinery, terminal) and its location.
- The method and frequency for initial testing, specification compliance testing and any other testing employed to either guide the manufacturing process of the PGAB or to ensure the on-going

compliance of the product(s) to Table 4.1.1.

- If specification compliance testing is carried out prior to shipping the product(s) from the supplier's facility to the hot mix plant, the QC Plan shall provide an outline of the procedures to be followed for checking transport vehicles before loading to prevent contamination of shipments.
- The QC Plan shall provide an outline of procedures detailing how anti-strip additives will be incorporated in the product(s) and how anti-strip additive products and dosage rates will be identified on shipping documentation. Tests employed to ensure compliance of the product(s) to Table 4.1.1 after anti-strip additives are incorporated in the product(s) shall be identified.
- The QC Plan shall identify the QC laboratory and detail control charting or any such statistical procedures which will be used to track the quality of the product(s).
- The QC Plan shall detail the methods to be used to identify and provide for the exclusion of materials which do not conform to specifications, prior to incorporating into the hot mix. The QC Plan shall also detail how such materials will be identified and dealt with in the event that they are inadvertently incorporated into the hot mix. The QC Plan shall detail how such occurrences will be documented, and the methods of disposition of such materials.

8.0 PRODUCT ACCEPTANCE

8.1 Basis of Initial Acceptance. Initial acceptance of PGAB will be based on QC test results submitted by the Contractor, subject to the conditions specified herein. The Contractor shall be responsible to submit the supplier's QC test result data and to ensure that all materials meet specification. The supplied product shall meet all the requirements of AASHTO Provisional Standard MP1 when the product is tested in accordance with the methods of AASHTO Provisional Standard PP6, Section 7, "Test Procedure for Verifying the Nominal Grade of an Asphalt Binder".

For initial acceptance purposes, a minimum of one complete MP1 compliance test shall be performed for each Supplier batch of PGAB.

8.2 Lot Sizes. Lot sizes for PGAB shall be based on the total tender quantity of asphalt concrete hot mix for each unique grade of PGAB. A Lot shall be terminated when the source of the PGAB is changed.

8.3 Quality Assurance. QA testing will be carried out by the Department for the purposes of ensuring that the materials used in the work conform to the quality requirements of Table 4.1.1. The entire tender quantity of asphalt concrete hot mix shall be considered one lot with QA sub-lot sampling and testing as follows:

Tonnes of Hot Mix	QA Sample Frequency
0 - 500	1
5 000 - 10 000	1
each additional 5 000	1

If a QA test result for any sample indicates non-compliance with the specification, the Department will advise the Contractor of the test result and may conduct classification testing. The additional testing will determine the actual performance high and low temperatures of the sample(s), rounded to the nearest 0.5 degrees Celsius.

Test results for sub-lots which do not comply with the performance grading requirements shall be categorized based on individual deviations from the design maximum or minimum temperature defined as follows. Price adjustments, where applicable, will be expressed as a percentage of the Contractor's unit bid price for the hot mix within the given sub-lot.

Temperature Deviation *	Payment	Price Adjustment (% of Mix Price)
≤3°C	Full	N/A
>3 & ≤6°C	Reduced	5 %
>6 & ≤9°C	Reduced	10 %
>9 & ≤12°C	Reduced	20 %

*** Note:** Actual performance gradings which are either higher than the maximum or lower than the minimum design temperature will be accepted at full price.

8.4 Disposition of Reduced/Rejected Lots. The Department will review the test results and determine the disposition of the mix constructed using any PGAB product which does not conform to Table 4.1.1. Hot mix constructed using PGAB for which test results indicate that the product did not conform to specification will be dealt with as follows:

Price Reductions: As per the above table.

Rejection: The Department reserves the right to reject all asphalt concrete mix produced with PGAB sub-lot temperature deviations exceeding 12 degrees Celsius. Rejected sub-lots shall be removed and replaced at the Contractor's expense.

The full thickness of the appropriate lift of pavement

shall be removed by cold milling. The asphalt concrete mix used to replace the rejected pavement shall meet the same requirements as those originally specified. Repair areas will be retested for acceptance with the cost of retesting to be borne by the Contractor.

9.0 APPEAL TESTING

The Contractor shall serve notice of appeal to the Project Engineer, in writing, within 48 hours of receipt of the QA test results. Appeal re-testing may be carried out on set-aside samples only if the cost of the impact of non-compliance, as determined by the Project Engineer, exceeds the cost of re-testing.

The Contractor may have a representative present during testing at the Department's QA facility. During the period of testing, the Contractor's representative shall comment on anything concerning the testing which he/she does not consider to be valid and the Project Engineer shall respond to all comments in order to resolve them.

The appeal testing will determine the actual performance high and low temperatures, rounded to the nearest 0.5 degrees Celsius, of the PGAB and the outcome is binding on the Department and the Contractor.

The cost of the appeal testing, including sample delivery, shall be borne by the Contractor unless the testing confirms total conformance of the material sample to contract specifications, in which case the cost will be borne by the Department.

10.0 METHOD OF MEASUREMENT

The quantity of PGAB to be paid for under this section shall be calculated on the basis of the PGAB delivered to the plant. The Department will not reimburse the Contractor for PGAB that is used in private work or any that is wasted as calculated on the weekly asphalt report. Adjustments will be made for initial and final tank measurements corrected to 15°C.

Plants that produce a large percentage of asphalt concrete for private work, such as in the Halifax-Dartmouth area and the Sydney area, will be paid for supply and transportation as calculated by the Field Adjusted Mix Design. The tonnages thus calculated will be payable to the Contractor.

11.0 BASIS OF PAYMENT

The supply and transportation of PGAB will be paid for at the contract unit price per tonne of PGAB. This price shall be compensation for any and all expenses that may be incurred in the supply, transport and delivery of the PGAB to the Contractor's plant.

12.0 WARRANTY

Table 4.1.1 - Performance Graded Asphalt Binder Specification

Performance Grade	PG-52							PG-58					PG-64					
	-10	-16	-22	-28	-34	-40	-46	-16	-22	-28	-34	-40	-10	-16	-22	-28	-34	-40
Average 7-day Maximum Pavement Design Temperature, °C[a]	<52							<58					<64					
Minimum Pavement Design Temperature, °C[a]	>10	>16	>22	>28	>34	>40	>46	>16	>22	>28	>34	>40	>10	>16	>22	>28	>34	>40
Original Binder																		
Flash Point Temp, T48: Minimum °C	230																	
Viscosity, ASTM D 4402:[b] Maximum, 3 Pa.s (3000cP), Test Temp, °C	135																	
Dynamic Shear, TP5[c] G*/sinδ, Minimum, 1.00 kPa Test temperature @ 10 rad/s, °C	52							58					64					
Rolling Thin Film Oven (T 240) or Thin Film Oven (T 179) Residue																		
Mass Loss, Maximum, %	1.00																	
Dynamic Shear, TP5: G*/sinδ, Minimum, 2.20 kPa Test temperature @ 10 rad/s, °C	52							58					64					
Pressure Aging Vessel Residue (PP1)																		
PAV Aging Temperature, °C[d]	90							100					100					
Dynamic Shear, TP5: G*sinδ, Maximum, 5000 kPa Test temperature @ 10 rad/s, °C	25	22	19	16	13	10	7	25	22	19	16	13	31	28	25	22	19	16
Physical Hardening[e]	Report																	
Creep Stiffness, TP1:[f] S, Maximum, 300 MPa m-value, Minimum, 0.300 Test Temp, @ 60s, °C	0	-6	-12	-18	-24	-30	-36	-6	-12	-18	-24	-30	0	-6	-12	-18	-24	-30
Direct Tension, TP3:[f] Failure Strain, Minimum, 1.0% Test Temp @ 1.0 mm/min, °C	0	-6	-12	-18	-24	-30	-36	-6	-12	-18	-24	-30	-0	-6	-12	-18	-24	-30

a. Pavement temperatures are estimated from air temperatures using an algorithm contained in the LTPP Bind program, may be provided by the specifying agency, or by following the procedures as outlined in MP2 and PP28.

b. This requirement may be waived at the discretion of the specifying agency if the supplier warrants that the asphalt binder can be adequately pumped and mixed at temperatures that meet all applicable safety standards.

c. For quality control of unmodified PGAB production, measurement of the viscosity of the original PGAB may be used to supplement dynamic shear measurements of $G^*/\sin\delta$ at test temperatures where the asphalt is a Newtonian fluid.

d. The PAV aging temperature is based on simulated climatic conditions and is one of three temperatures 90°C, 100°C or 110°C. The PAV aging temperature is 100°C for PG58- and above, except in de climates, where it is 110°C.

e. Physical Hardening - TP1 is performed on a set of asphalt beams according to Section 13.1, except the conditioning time is extended to 24 hrs ± 10 minutes at 10°C above the minimum performance temperature. The 24-hour stiffness and m-value are reported for information purposes only.

f. If the creep stiffness is below 300 MPa, the direct tension test is not required. If the creep stiffness between 300 and 600 MPa the direct tension failure strain requirement can be used in lieu of the creep stiffness requirement. The m-value requirement must be satisfied in both cases.

g. $G^*/\sin\delta$ = high temperature stiffness and $G^*\sin\delta$ = intermediate temperature stiffness.

SECTION 3 - ASPHALT CONCRETE CURBS & GUTTERS

1.0 DESCRIPTION

Asphalt concrete for curbs, gutters and drains shall consist of carefully controlled hot-laid plant mix of asphalt cement and dense graded quality aggregate thoroughly mixed and then compacted to a uniform density. It shall be placed on a prepared base in conformity with the lines, grades and cross-sections as shown in the plans herein and as directed by the Engineer.

2.0 REFERENCES

All reference standards shall be current issue or latest revision at the first date of tender advertisement. This specification refers to the following standards, specifications or publications:

- Division 3 Section 5, Compaction of Gravels
- Division 4 Section 1, Emulsified Asphalt
- Division 4 Section 2, PGAB
- Division 4 Section 4, Asphalt Concrete-Hot Mixed-Hot Placed
- Drawing HS402.DWG.
- Drawing HS403.DWG.

3.0 SUBMISSIONS AND DESIGN REQUIREMENTS

At the discretion of the Engineer an asphalt concrete mix design for Type B or Type C may be provided as detailed in Division 4 Section 4 or an existing plant mix may be used.

4.0 MATERIALS

4.1 Aggregate. The aggregate shall conform to the specifications detailed in Division 4 Section 4 for asphalt concrete Type E. When gutter mix is placed using an asphalt road spreader or spreader attachment in conjunction with the road paving operation, the Engineer may approve the use of Type B or Type C asphalt concrete.

4.2 Asphalt Binder. Unless otherwise specified, the asphalt binder shall be PGAB 58-28. The Contractor shall supply and transport all PGAB used in the manufacture of asphalt curbs and gutters in accordance with Division 4 Section 2. The asphalt concrete shall contain 6.0 to 9.0% asphalt binder by mass of total mix. When gutter mix is placed in conjunction with road paving using the road spreader or spreader attachment the asphalt binder type and amount will be as specified for the Type B or Type C mix.

4.3 Asphalt Concrete. The production, transportation and placement of the asphalt concrete shall conform to the requirements of Division 4 Section 4.

5.0 CONSTRUCTION METHODS

5.1 Curb. The contractor shall construct curb according to Drawing HS402 in specified locations. The machine used for placing the curb shall be self-powered and capable of extruding and compacting the asphalt concrete to the line, grade and cross-section shown on the plans or otherwise specified.

The surface on which the curb is to be placed shall be dry and free from all loose and foreign material. A tack coat shall be applied to the surface at a rate of 500 to 800 ml/m^2. For proper support on the pavement edge, the back of the curb should be a minimum of 150 mm from the edge unless otherwise specified by the Engineer.

5.2 Gutter. The Contractor shall construct asphalt concrete gutter as and where directed according to the Department plan for Asphalt Concrete Gutter, Drawing HS403 or to such other dimensions approved by the Engineer.

Where the gutter is to be placed on a granular base the base material shall be graded to the shape of the gutter and then compacted as detailed in Division 3 Section 5 except that the size of the control strip may be modified at the direction of the Engineer.

In areas where the gutter is to be placed subsequent to road surface paving, tack coat conforming to the requirements of Division 4 Section 1 of these specifications shall be applied to the edge of the previously placed asphalt concrete pavement at a rate of 500 to 800 ml/m^2 before the asphalt concrete gutter is placed.

Upon completion of placing and shaping, the asphalt concrete for gutter shall be compacted to 94% of the theoretical maximum relative density or to the satisfaction of the Engineer.

6.0 QUALITY CONTROL / QUALITY ASSURANCE

7.0 METHOD OF MEASUREMENT

7.1 Curb. The quantity of curb for which payment will be made shall be the length placed as measured along the line and grade of the curb. Modified curb sections

across driveways are to be included in the measurement.

7.2 Gutter. The quantity of gutter for which payment will be made shall be the length placed as measured along the line and grade of the gutter. Length of offtakes will be measured from back of longitudinal gutter to outlet and added to the length of longitudinal gutter.

8.0 BASIS OF PAYMENT

8.1 Gutter Placed During Paving Operation. Payment will be made at the contract unit price per linear metre for asphalt concrete gutter plus tonne of asphalt concrete placed to construct the gutter. The asphalt concrete will be paid at the contract unit price per tonne of surface mix.

Payment shall include the cost of furnishing all labour, tack coat, aggregate, blend sand and equipment necessary to satisfactorily complete the work.

8.2 Curb and Gutter Placed Subsequent to the Paving Operation. Payment will be made at the contract unit price per linear metre for asphalt concrete curb and gutter plus tonne of asphalt concrete used to construct the curb and gutter. The asphalt concrete will be paid at the contract unit price per tonne of asphalt concrete used.

Payment shall include the cost of furnishing all labour, tack coat, aggregate, blend sand and equipment necessary to satisfactorily complete the work.

8.3 Supply and Transportation of PGAB. PGAB will be paid for at the contract unit price per tonne as outlined in Division 4 Section 2, Subsection 11.0 Basis of Payment.

9.0 WARRANTY

SECTION 4 - ASPHALT CONCRETE HOT MIXED - HOT PLACED

1.0 DESCRIPTION

Asphalt concrete is defined as a carefully controlled mixture of PGAB and mineral aggregate thoroughly mixed to be free from segregation and contamination and then placed and compacted to a uniform density and smooth finish. This section includes requirements applicable to: quality control, materials, manufacturing, transportation, placing, compaction, finishing, measurement and payment of asphalt concrete.

2.0 REFERENCES

All reference standards shall be current issue or latest revision at the first date of tender advertisement. This specification refers to the following standards, specifications or publications:

- Division 4 Section 1, Emulsified Asphalt
- Division 4 Section 2, PGAB
- Occupational Health and Safety Act
- Environmental Protection Act
- 1981 Asphalt Paving Plant Regulations
- Asphalt Institute Manual Series 2 (MS-2)
- ASTM C 207, Specification for Hydrated Lime
- AASHTO T 283, Resistance of Compacted Bituminous Mixture to Moisture Induced Damage
- ASTM C 88, Test Method for Soundness of Aggregates by use of Sodium Sulfate or Magnesium Sulfate
- ASTM C 117, Test Method for Material Finer Than 75µm (No. 200) Sieve in Mineral Aggregates by Washing
- ASTM C 127, Test Method for Specific Gravity and Absorption of Coarse Aggregate
- ASTM C 128, Test Method for Specific Gravity and Absorption of Fine Aggregate
- ASTM C 131, Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
- ASTM C 136, Method for Sieve Analysis of Fine and Coarse Aggregates
- ASTM D 75, Practices for Sampling Aggregates
- ASTM D 140, Practice for Sampling Bituminous Materials
- ASTM D 546, Test Method for Sieve Analysis of Mineral Filler for Road and Paving Materials
- ASTM D 995, Specification for Requirements for Mixing Plants
- ASTM D 1559, Test Method for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus
- ASTM D 2041, Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
- ASTM D 2726, Test Method for Bulk Specific Gravity of Compacted Bituminous Mixtures Using Saturated Surface-Dry Specimens
- ASTM D 2950, Test Method for Density of Bituminous Concrete in Place by Nuclear Method ASTM D 3203, Standard Test Method for Air Voids in Compacted Bituminous Paving Mixtures
- ASTM D 3515, Specification for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures
- ASTM D 4469, Method for Calculating Percent Asphalt Absorption by the Aggregate in an Asphalt Paving Mixture
- ASTM D 4791, Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
- DOT&PW TM-2, Modified Petrographic Analysis
- DOT&PW TM-3, Fractured Particle Test

The limits of placing, spread rate and the Mix Type shall be as stated in the Special Provisions.

3.0 SUBMISSIONS AND DESIGN REQUIREMENTS

3.1 Certificate of Approval for Asphalt Plant. The Contractor shall obtain a certificate of approval for the Asphalt Concrete Plant from the Nova Scotia Department of the Environment prior to the commencement of work.

3.2 Mix Design. The asphalt concrete shall conform to the requirements specified herein and in the Special Provisions when tested in accordance with procedures provided in the latest edition of the Asphalt Institute Manual Series 2 (MS-2) with the exception when calculating asphalt absorption, ASTM D4469, Method for Calculating Percent Asphalt Absorption by the Aggregate in an asphalt paving mixture shall be followed.

The Contractor shall have a minimum of 1000 t of coarse aggregate and 1000 t of fine aggregate placed in stockpiles before samples for mix design purposes will be taken.

The Department or its representative will obtain samples of the aggregate and any additives and undertake the mix design. In all cases, a minimum of 14 days will be required for design purposes after the samples have been taken.

An initial design for all mixes (high friction and conventional) will be based on the use of aggregate sources as selected by the Contractor and will require the use of blending sand from additional sources where possible. A maximum of 15% blend sand may be used in the mix design for high friction and conventional mixes, however, the amount of blend sand eligible for haul payment shall be the actual tonnage of blend sand used on a daily basis, or up to

10% by mass of the total mix in which the blend sand was required. If the blend sand design does not meet the gradation requirements of Table 4.4.4, the Contractor shall make adjustments to meet the requirements of Table 4.4.4 and Table 4.4.1. The results of each mix design will be provided to the Contractor.

Table 4.4.1 - Physical Requirements Of Asphalt Concrete

Item	Standard	Requirements	Application Road Class	Mix Type
Marshall Stability[1] @ 60°C, kN	ASTM D 1559	MIN 7.5	Freeway, Arterial, Truck Route	A,B,B-HF, C, C-HF & D
		MIN 6.0	Collector	B,C & D
		MIN 4.5	Local	B,C, & D
Marshall Flow, mm	ASTM D 1559	2 - 4[3]		A,B,B-HF, C, C- HF, D& E
Voids in Mineral Aggregate[2], %	ASTM D 2041, ASTM D 4469	MIN 15		D-HF, D & E
		MIN 14		C,C-HF
		MIN 13		B & B-HF
		MIN 12		A
Air Voids, %	ASTM D 2041	3 - 5		A,B,B-HF C, C-HF,D & E
VFA[4], %		65 - 78		A,B,B-HF C, C-HF,D & E

[1] Each Marshall specimen shall receive 75 blows on each face.
[2] Bulk Specific Gravity calculated on Oven Dry basis
[3] Equivalent to 8-16 Marshall units (units of 0.25 mm each)
[4] VFA will be 70-80% for roads of <1000 AADT.

3.2.1 Field Adjusted Mix Design. The final laboratory mix design will be implemented as the initial trial for plant mix with any necessary adjustments immediately being made by the Department or its representative. These adjustments will be documented as the Field Adjusted Mix Design (FAMD). Any additional adjustments will result in an additional documented FAMD. Copies of all FAMD will be provided to the Contractor.

All Field Adjusted Mix Designs shall meet the requirements of Table 4.4.4, Table 4.4.1 and Subsection 3.2.2. All quality control tests will be measured against the documented FAMD.

3.2.2 Mix Tolerance. The maximum permissible variation from the Field Adjusted Mix Design for gradation (total aggregate) and PGAB content in percent by mass shall be as follows:

5 000 sieve and larger	± 5
Held on 1250 sieve	± 3
Held on 160 sieve	± 2
Held on 80 sieve	± 1
PGAB	± 0.3

3.3 Additives. Additives shall not be used in the mix without the approval of the Engineer. Any additive intended for use shall be incorporated in the mix design in the proportion to be used during production and in accordance with the Manufacturer's specifications. If silicone is being added to the PGAB then care shall be taken to ensure that it is being added at only one location i.e. at the refinery, in the tanker truck, or at the plant.

The Department may permit the use of antistripping agents.

All additives, except anti-stripping additives, shall be

included in the unit price for Asphalt Concrete.

3.4 Asphalt Concrete Stripping. The Contractor is hereby advised that if their aggregate for asphalt concrete is moisture susceptible they shall have the option of either using a liquid anti-stripping additive from the Department's list of acceptable products, using hydrated lime, or changing their source of aggregate.

The Department may determine that an anti-stripping additive is required if one of the following conditions occurs:

- The long term tensile strength ratio of the asphalt concrete as per AASHTO T 283 is less than 0.73
- Material that has been conditioned per AASHTO T 283 meets the 0.73 minimum requirement but a visual examination indicates there is evidence of stripping
- If based on past performance the aggregate source is known to be prone to stripping

3.4.1 Testing Rejected Aggregate Incorporating Anti-Stripping Agents. If the aggregate for asphalt concrete fails the Stripping Test, the Contractor at their own expense for all related testing, may request through the Project Engineer that the Department's Quality Control Consultant conduct a second set of Stripping Tests, this time incorporating an anti-stripping agent. Approval to use an anti-stripping agent will only be given if it is determined from this testing that the long term TSR of the mix with an anti-stripping agent equals or exceeds 0.73 and the visual examination indicates there is no evidence of stripping. The Contractor shall also demonstrate the capability of properly adding hydrated lime to the mix at the hot-mix plant if hydrated lime is proposed for use as an anti-stripping agent. If the TSR is still less than 0.73, the aggregate will be rejected and the Contractor shall locate another aggregate source.

3.4.2 Approval of Anti-Stripping Agents. In all cases a minimum of 14 working days are required to perform the stripping test after the aggregates have been received by the inspection company. An additional 14 working days will be required for re-testing of aggregate with an anti-stripping agent. The Contractor shall provide the anti-stripping agents to be utilized in all testing as well as any technical information and Manufacturer's recommended addition rates.

3.4.3 Addition of Liquid Anti-Stripping Additive. The liquid anti-stripping additive shall be added at a rate as determined by the mix design to the PGAB at the Supplier's depot, concurrently, with loading of the PGAB into the Carriers tanker. Any other methods of adding liquid anti-stripping additive shall be subject to the approval of the Engineer. The Contractor shall be required to demonstrate the method to the Engineer before approval will be considered.

The Contractor shall supply in writing to the Department, the supplier's name, product name and percentage of liquid anti-stripping additive used for each tanker load of PGAB delivered to the Contract.

3.4.4 Pavers Placing Asphalt Containing Liquid Anti-Stripping Agents. If required, and the Contractor elects to use a liquid anti-stripping additive, all pavers used to place asphalt concrete containing liquid anti-stripping additive shall be equipped with an engineered control ventilation system with a minimum controlled indoor capture efficiency of 80%.

3.4.5 Weather Conditions on Projects Containing Liquid Anti-Stripping Additives. If required, and the Contractor elects to use a liquid anti-stripping additive, the Contractor is advised that special precautions and scheduling of work may be necessary to effectively and safely produce and place asphalt concrete.

Contractors are advised that certain weather conditions such as fog, high humidity or rain require special precautions and these conditions may necessitate a shut down of operations.

If the Project Engineer determines that weather conditions are not acceptable, asphalt concrete shall not be placed. The Department takes no responsibility for costs associated with job shut downs and asphalt concrete which is not placed as a result of unacceptable weather conditions.

3.4.6 Payment for Liquid Anti-Stripping Additives. If required, and the Contractor elects to use a liquid anti-stripping additive, the Department will pay an amount as specified in the Contract Special Provisions for the use of an acceptable liquid anti-stripping agent which shall be full compensation for supplying, transporting and all related costs and labour incidental to the work.

If required, and the Contractor elects to use a hydrated lime as an anti-stripping additive, the Department will pay an amount as specified in the Contract Special Provisions for the use of hydrated lime which shall be full compensation for supplying, transporting and all related costs and labour incidental to the work.

4.0 MATERIALS

4.1 Aggregates. The aggregates shall be crushed pit run or quarried stone or slag and sand conforming to the quality requirements as stated herein and shall be free from coatings of clay, silt or other deleterious material.

4.1.1 Supply of Aggregates. It shall be the Contractor's responsibility to locate, procure and/or manufacture and deliver all aggregates, including blend sand or blending stone, required to meet the specified combined aggregate gradation requirements or to meet

other specified properties of the aggregate and of the asphalt concrete. Promptly after receiving notice of award of contract, the Contractor shall inform the Engineer of the location of all aggregate sources.

Preliminary or previous approval of any aggregate shall not constitute a final approval of that aggregate.

4.1.2 Blend Sand. A definition of blend sand is as follows: Blend sand is a material added to a mix for the purpose of enhancing mix properties and workability. Blend sand may be either a natural uncrushed fine aggregate or a manufactured sand.

The maximum amount of natural uncrushed fine aggregate used as a blend sand shall be limited to 15% of the total aggregate in all mix types.

4.1.3 Supply of Blend Sand. After the Field Adjusted Mix Design has been developed (as outlined in Subsection 3.2.1) a supply of at least one day's production of blend sand shall be maintained in stockpile at all times

4.1.4 Blending Aggregates. Blending of aggregates from two or more sources will only be permitted when the Petrographic Number (PN) for the aggregate from any of the sources does not exceed the specified Petrographic Number by more than 10%.

The minimum amount of blended coarse aggregate shall not be less than 10% of the stone fraction. The coarse aggregate shall be blended through the cold feed bins.

Sand from another source may be used without blending, provided the stone from which the sand is produced has a PN not more than 10% higher than the specified PN. The stone portion of the mix shall have a PN less than or equal to the specified PN.

4.1.5 Physical Requirements of Aggregates. The physical requirements of the aggregates shall be as shown in Table 4.4.2 and Table 4.4.3.

Table 4.4.2 - Physical Requirements of Aggregate[1]

Test Name	Standard[2]	Requirement
Los Angeles Abrasion, %	ASTM C 131	Max. 35
Soundness, %[3]	ASTM C 88[6]	Max. 15
Fractured[4] Particles, 2 Fractured Faces, % by Mass[8]	DOT&PW[7]	See Table 4.4.3
Petrographic Number[4]	DOT&PW[7]	See Table 4.4.3
Stripping Test, %	AASHTO T 283	Min. 0.73
Absorption, %[5]	ASTM C 127	Max. 1.75
Flat and Elongated Particles (4:1)	ASTM D 4791	Max. 10

[1] Applies to all aggregates including those used for blending.

[2] Latest edition

[3] The soundness loss permitted will be 15% on fine aggregate other than for A, B-HF, C and C-HF. Soundness loss on fines for A, B-HF, C and C-HF, will be 10%.

[4] In the event of a disagreement regarding the Petrographic Number or Fractured Particles percentage, the Contractor shall note their objections in writing to the Engineer such that the Engineer will notify the Manager of Technical Services of impending referee testing. An analysis will then be done, as follows:

- The Manager of Technical Services will arrange to have the stockpile sampled. If a Technical Services Specialist is not available to sample, the Engineer will sample the stockpile. The Contractor will observe the sampling procedure.
- The sample will be taken to Technical Services. All Consultants that are retained by the Department for asphalt concrete quality control or a minimum of two consultants, will be asked to send a representative to Technical Services to test a representative portion of the sample.
- The sample will be split and each Technician will perform the Petrographic test or Fractured Particles Test. The results will be given to Executive Director District Operations, who will make the final decision with respect to the use of the aggregate, using the average of the test results as a guide.

[5] Fine aggregate shall have maximum absorption of 2.0 % when tested by ASTM C 128.

[6] Test to be performed using sodium sulphate.

(7) Standard test procedures are available from Technical Services, if requested.

(8) A fractured particle consists of two (2) fractured faces which each consist of a minimum of 20% of the surface area of the particle. Particles with smooth faces and rounded edges, or with only small chips removed are not considered fractured.

Table 4.4.3 - Quality of Coarse Aggregate vs AADT

Type	AADT[1]	PN	Fractured Particles, %
A	N/A	135	95[2]
B-HF	N/A	135	95[2]
C-HF	N/A	135	95[2]
D-HF	N/A	135	95[2]
C	2500-4000	150	70
C	1000-2499	150	40
B	1000-2499	180	40
C	Below 1000	180	40
B	Below 1000	180	40
D	N/A	N/A	N/A
E	N/A	180	40

(1) Average Annual Daily Traffic

(2) The coarse aggregate shall be made from a quarried source or contain 95% fracture particles.

The fine aggregate for all mix types shall be produced from bedrock, or in the case of a natural deposit, from the aggregate held on the 10 000 sieve. A tolerance of 10% passing the 10 000 sieve, based on a washed sieve analysis, will be permitted.

4.1.6 Gradation of Combined Aggregate. The gradation of the combined processed aggregate for the asphalt concrete shall conform to the values shown in Table 4.4.4 when tested by washed sieve analysis according to ASTM C 117, C 136 and D 546.

Table 4.4.4 - Gradation of Combined Aggregates

Sieve Designation	Cumulative Percent Passing							
	Type A	Type B	Type B-HF	Type C	Type C-HF	Type D	D-HF	Type E
40 000	100							
28 000	95-100	100	100					
20 000	-	95-100	95-100	100	100			100
14 000	60-80	-	70-90	95-100	95-100	100	100	85-100
10 000	-	60-80	60-75	-	-	95-100	70-90	-
5 000	25-60	35-65	40-55	45- 70	45-60	60- 80	55-70	65- 80
2 500	15-45	20-50	25-45	25- 55	25-55	35- 65	25-55	50- 65
315	3-18	3-20	3-20	5- 20	5-20	6- 25	5-20	18- 30
80	1-7	2- 8	3- 6.5	2-9	3-6.5	2-10	2-9	5- 15
Normal Usage	Base	Base/ Surface	Base/ Surface	Surface	Surface	Surface	Surface	Curbs/ Gutters Medians

4.1.7 Stockpiling of Aggregates. Aggregates shall be stockpiled as herein described so as to limit segregation, intermingling and contamination. Where the location of aggregate manufacture is different from the location of asphalt concrete production, stockpiles at all locations shall comply. Only those aggregates placed in stockpiles approved by the Department shall be used. Stockpiles shall be formed on evenly graded and well drained areas. Stockpiling shall not commence until the site is approved by the Engineer considering the total area required based on the maximum height allowed and the minimum quantity to be stored in the stockpiles.

The aggregate for asphalt concrete shall be separated into a coarse fraction and a fine fraction and the two fractions shall be placed in separate stockpiles.

The coarse aggregate stockpile(s) shall contain a minimum of 80% retained on the 5000 sieve by washed sieve analysis.

The fine aggregate stockpile shall contain a minimum of 80% passing the 5000 sieve by washed sieve analysis.

Stockpiles shall be built in layers not exceeding I m in thickness for coarse aggregate nor 2 m in thickness for fine aggregate. Each layer shall be constructed over the entire area before the next layer is begun. The maximum height shall not exceed 4 m. Coning, end dumping or pushing aggregate over the edge of stockpiles will not be permitted. Aggregates, delivered in trucks or loaders, shall be uniformly spot dumped and the stockpile built as specified in the foregoing.

Stockpiles shall be separated either by bulkheads or distance to avoid intermingling of material in one stockpile with that in another stockpile. Placing of unacceptable aggregate on previously accepted aggregate shall be cause for rejection of the entire stockpile. Payment will not be made for any aggregate left in stockpile.

4.1.8 Quantity of Aggregate in Stockpile During Mix Production. The quantity of aggregate in stockpile during periods of mix production shall be the minimum of 20 hours of production for both coarse and fine aggregate or the quantity required to complete the job.

4.2 PGAB, Supply and Inventory. The Contractor shall supply and transport all PGAB, used in the manufacture of asphalt concrete, in accordance with Division 4 Section 2.

The quantity of PGAB in the Contractor's storage

tank(s) at the beginning and end of a job will be determined by the Engineer.

If there is PGAB in the Contractor's tank(s) at the beginning of the job that is not acceptable for use by the Department it shall be removed. If the tank is contaminated with hydrocarbon fuels or solvents, it shall be cleaned to remove all contaminants before PGAB to be used on the job is placed in the tank(s).

If there is PGAB that belongs to the Contractor in the tank(s) at the beginning of the job, and provided it meets Department's specifications, the Contractor may use it in the work.

4.3 Anti-Stripping Agents. The anti-stripping agents shall consist of one of the following:
- Hydrated Lime ($Ca(OH)_2$)
- Liquid Anti-Stripping Agent

4.3.1 Lime

4.3.1.1 Lime Storage. When hydrated lime is used as an anti-stripping agent, the Contractor shall have the capability of storing 50 t of lime at the hot-mix plant. The storage facility shall maintain the lime in dry condition and shall be capable of agitating the lime by air or other means to keep it in a uniform, free flowing condition. Storage facilities shall have the capability to accept shipments of lime while the asphalt plant is in operation.

4.3.1.2 Metering/Feeder System-General. The hydrated lime proportioning or metering/feeder system shall be controlled by a mass or volumetric device which shall be accurate to within ±10% of the amount required. The lime metering/feeder system shall be capable of uniformly delivering lime in quantities between 0.5 to 2.5% by dry weight of aggregate. Lime shall be drawn from a storage facility as specified herein.

The lime metering/feeder system shall display the following:
- percent moisture in the total aggregate;
- tonnes per hour of dry aggregate;
- tonnes per hour of lime.

The display output shall be from actual continuous scale readings.

4.3.1.2.1 Mass or Weight System. This type of hydrated lime proportioning system shall consist of a continuous feeder system which shall proportion the flow rate of lime by mass or weight. The lime feeding system shall be controlled by a positive weighing system. The system shall have the capability of continuously monitoring the flow rate of dry aggregate in tonnes per hour. The system shall automatically adjust the flow of lime for any change in dry aggregate flow rate.

4.3.1.2.2 Volume System. This type of lime proportioning system shall be a vane type metering device which is interlocked to the flow of each aggregate. The drive shaft on the vane feeder shall be equipped with a revolution counter and a means of varying the rate.

4.3.1.3 Moisture Correction. The combined moisture content of the aggregates shall be entered into the lime metering/feeder control system and the system shall be capable of providing a dry aggregate tonnes per hour signal to the lime/feeder control.

4.3.1.4 Positive Signal System. The lime metering/feeder system shall contain a positive signal system that automatically shuts down the plant after a 15 second delay or if there is a disruption of flow of lime or water.

4.3.1.5 Monitoring System. The lime metering/feeder system shall contain a means of determining the quantity of lime being introduced into the aggregate while the plant is operating.

4.3.1.6 Calibration. The Contractor shall check the calibration of the lime metering/feeder system prior to the production of asphalt concrete or as directed by the Engineer.

4.3.1.7 Water Delivery System. When dry hydrated lime is utilized, a water delivery system shall be used to dampen the combined aggregates on the cold feed belt to a moisture content between 1.5 to 3.0% above the combined saturated surface dry moisture content of the aggregates. The water delivery system shall consist of a spray bar with a minimum of 3 equally spaced spray nozzles. The spray bar shall be located so as to wet the aggregate prior to the addition of the lime.

4.3.1.8 Water. Potable water or water that is clean and free of dirt, silt and deleterious material shall be used as a wetting agent.

4.3.1.9 Addition of Lime. Lime shall be added to the aggregate by the dry method or the slurry method.

4.3.1.9.1 Dry Method. Hydrated lime shall be drawn from a lime storage facility by metering/feeder system and combined with aggregate and water with a mixing device as specified herein.

4.3.1.9.2 Slurry Method. A slurry containing one part hydrated lime and three parts water by mass shall be used. The slurry shall be prepared in a central mixing tank provided with agitation to keep the lime in suspension until applied to the aggregate. The plant

shall be equipped with suitable pumps and meters for introducing the required amount of slurry to the aggregate. The addition of hydrated lime in the form of a slurry form shall not require adding moisture to the aggregate prior to mixing of the lime slurry and aggregate.

4.3.1.10 Mixing Device. Mixing of the aggregate and lime for either the dry or slurry methods shall be accomplished by passing the combined materials:

- through a scalping screen
- through a set of plows or mixing paddles on the cold feed belt
- an in-line pugmill placed in the cold feed system between the gathering conveyor and the charging conveyor

4.3.2 Liquid Anti-Stripping Additives. The products on the following list have been subjected to an internal review by the Department respecting formulation and the toxicology of ingredients and have been determined to meet Department criteria for use on paving projects. The acceptable liquid anti-stripping additives are as listed in Table 4.4.5.

Table 4.4.5 - Anti-Strip Additives

Supplier	Product
Akzo Nobel Chemicals	Redicote C 3082
Akzo Nobel Chemicals	Redicote 95-S
Morton International	Pave Bond "T" Lite
Morton International	Pave Bond Lite
Travis Chemicals	Travcor 4501
Win Chemicals Ltd.	WinSurf 129-A
ARR-MAZ Products	AD-here LOF 6500

Inclusion on this list does not attest to efficacy of use with any specific aggregate or approval for use on any specific project. Testing for each project shall be required for this purpose. This list is subject to revision.

4.3.2.1 Information Sessions and Worker Training. At a pre-construction meeting the Contractor shall inform the Engineer of the supplier's name and product name of liquid anti-stripping additive that is to be used on the contract if one is required. At this time the Contractor and the Department will review the requirements for use of the liquid anti-stripping additive, including proper procedures, worker information, use of protective clothing and equipment, removal of sensitive workers, site supervision and contingency system.

The Contractor shall advise workers of the proper procedures to be followed when working with PGAB or asphalt concrete containing liquid anti-stripping additive.

The Contractor shall ensure that Carriers retained to haul the PGAB containing liquid anti-stripping additive have received training with respect to working with PGAB containing liquid anti-stripping additive.

The Department shall provide training with respect to working with PGAB or asphalt concrete containing liquid anti-stripping additive for its employees or representatives.

4.3.2.2 Mandatory Respiratory Protection. The Contractor shall provide at their expense Respiratory Protective Equipment for any of their staff that are directly exposed to the concentrated vapours of PGAB containing liquid anti-stripping additive (unless exhaust ventilation is provided) such as those who may be subjected to the plume from the PGAB storage tank. The Contractor shall ensure that these staff wear the Respiratory Protective Equipment. (The Department shall provide at its expense similar protective equipment for its employees or representatives and shall ensure that the protective equipment is worn.)

4.3.2.3 Voluntary Respiratory Protection. The Contractor shall provide upon the request of its employee, and at the Contractor's expense, Respiratory Protective Equipment for any of their employees who feel they are adversely affected (eye, nose, throat, lung irritation, nausea, etc.) by the odors of the asphalt concrete containing liquid anti-stripping additive. (The Department will provide at its expense and upon request similar protective equipment for its employees or representatives.)

4.3.2.4 Respiratory Protective Equipment Specifications. Respiratory Protective Equipment shall consist of a full face mask, to protect eyes as well as respiratory system, and shall be equipped with organic vapour cartridges and dust pre-filters. Cartridges shall be replaced whenever the smell of vapours is detected by the worker using the respirator. Pre-filters shall be replaced when they become visibly dirty or when resistance to breathing becomes noticeable.

4.3.2.5 Relocation of Worker Sensitive to Liquid Anti-Stripping Additive When Wearing Respiratory Protective Equipment. The Contractor shall, at the request of a worker adversely affected by the vapours of PGAB containing liquid anti-stripping additive or the odours of asphalt concrete containing liquid anti-stripping additive (who cannot be adequately protected by wearing respiratory protective equipment) relocate the worker to work in an area where the worker is not

affected.

If the Contractor recognizes that a worker adversely affected, the Contractor shall relocate that worker to work in an area where the worker is not affected.

The Department will, at the request of an employee adversely affected by the vapours of PGAB containing liquid anti-stripping additive or the odours of asphalt concrete containing liquid anti-stripping additive (who cannot be adequately protected by wearing respiratory protective equipment) relocate the employee to work in an area where the employee is not affected. Relocating a Department employee sensitive to anti-stripping vapours may result in minor delays to the paving operations.

If the Department recognizes that a worker is adversely affected, the Department will relocate that worker to work in an area where the worker is not affected.

4.3.2.6 Monitoring of Air Quality. The Department will, at its expense on some contracts, monitor the air quality at various locations of the paving operations. The Contractor shall cooperate with respect to this testing, by providing access to all aspects of the paving operation to the Department or its representative.

4.3.2.7 Contingency System. The Contractor shall have an employee on site who will be authorized (this employee shall be identified at the pre-construction meeting) to make decisions regarding any difficulties that may arise during the paving project.

5.0 CONSTRUCTION METHODS

5.1 Manufacturing Mix

5.1.1 Hot Mix Plants. All manufacturing shall be done with either a batch, drum or continuous mixing plant. All plants shall conform to the requirements of ASTM D995 and as specified herein. The Contractor shall ensure that the hot mix plant is operating properly so that unburned burner fuel does not contaminate the asphalt concrete.

5.1.1.1 Cold Bins. Cold bins for all mixes shall be divided into not less than three compartments. Each compartment shall be equipped with its own gate control to enable accurate proportioning of each aggregate. Dimensions of each compartment shall be such that free flow of aggregate can be attained at all times. Contamination of the aggregate designated to be placed in each compartment before or after placement in the bins shall be cause for rejection of the material.

If the cold bins are being fed with a front end loader the Contractor shall ensure that there is no spillage from the loader bucket such that aggregate of one size is spilled into a bin containing aggregate of a different size.

5.1.1.2 Feed for Dryer. The plant shall be provided with mechanical means for uniformly and accurately feeding aggregate into the dryer so that a consistent mixture and temperature can be achieved.

5.1.1.3 Dust Collector. The plant shall be operated so that emissions are in accordance with the 'Asphalt Paving Plant Regulations'.

5.1.1.4 PGAB Storage Tanks. Storage tanks shall be insulated and equipped with heaters to maintain the PGAB at the spraying temperature given in Division 4 Section. Each tank shall be equipped with thermometric equipment that indicates within 5°C, the actual temperature of the PGAB. Safe and easy access shall be provided to the hatch to facilitate sampling and measuring the level of PGAB in the tank(s). The Contractor shall be responsible to supply an acceptable device for measuring the level of PGAB and an accurate calibration chart for each tank. The Contractor shall ensure that contamination of the mix does not occur through the introduction of heating oil. The use of hydrocarbon fuels or solvents to flush hoses and/or pumps shall not be permitted.

5.1.1.5 Sampling Stand. The Contractor shall provide, install and maintain a stand for the purpose of sampling asphalt concrete from loaded trucks. It shall be of solid construction, safe, firmly anchored, of a height to enable easy acquisition of samples from the haul vehicles. The stand shall have a platform of minimum dimensions area of 3 m in length and 1 m in width, be equipped with stairs and be completely enclosed with guard and hand rails and it shall be placed in a suitable location.

5.1.1.6 Production Rate. Plants shall be operated at a rate which allows them to produce high quality mix, consistent with the Manufacturers recommendations. They shall also be operated at a rate to provide continuous operation compatible with the rate of placing the mix.

5.1.2 Batch and Continuous Mix Plants. In addition to the general requirements in Subsection 5.1, the following shall apply:

5.1.2.1 Aggregate Preparation (See also Sections 6.2.1, 6.2.2 and 6.2.3). Aggregate shall be fed to the cold bins from approved stockpiles and not directly from the crusher. Feed from the cold bins to the dryer shall be in proper proportions and at a rate to permit uniform temperature control. The aggregate shall be dried and transported to the pugmill at a temperature between 135°C and 160°C. The actual temperature shall be

determined based on the penetration grade of the PGAB, the ambient temperature and workability, but shall be as low as possible to permit proper mixing, placing, compacting and finishing.

Immediately after heating, the aggregate shall be screened into bins with separation on the 5000 sieve and such other coarse sieve sizes as the number of bins permit.

The quantity of aggregate in stockpile at the asphalt plant site during periods of mix production shall be at least equal to the amount required for 20 hours of mix production or the quantity required to complete the job.

5.1.2.2 Proportioning and Mixing. Each size of aggregate and the PGAB shall be measured separately and accurately in the proportions in which they are to be mixed. The depth of material in the pugmill shall be set so that there are no dead areas and the asphalt concrete is uniformly mixed.

In batch plants, dry mixing shall be for 15 seconds and after even distribution of the PGAB, a minimum of 30 seconds wet mixing, or according to the manufacturers specification.

Continuous mix plants shall have a minimum mixing cycle as calculated by the formula in ASTM D 995, but no less than 45 seconds.

Provision shall be made to waste all of the dust or to uniformly return any or all of the dust as required to meet the specifications.

5.1.3 Drum Mix Plants. In addition to information in Section 5.1.1, the following shall apply:

5.1.3.1 Aggregate Preparation (See also Subsection 4.1.7). Continuous testing of the aggregate produced during the crushing operations shall be performed and upon completion of crushing of the initial 1500 t of fine aggregate and 1500 t of coarse aggregate, a mean value for percent passing the 5000 sieve for each shall be determined. The mean values are referred to as design values. Aggregates crushed henceforth must have gradation within 5% of the design values and also comply with the 80% requirement in Subsection 4.1.7.

5.1.3.2 Cold Feed System. Each cold feed bin shall be adjusted and calibrated to the manufacturer's specification; have partitions adequate to prevent the intermingling of aggregate; feed only one aggregate size through a fully adjustable gate; and have the belt conveyor controlled remotely by variable speed motors that will permit precise speed adjustment.

A belt scale shall be provided on the cold feed conveyor and shall be calibrated to the manufacturer's tolerance at the start of each project, or whenever the weighing conveyor is moved or when deemed necessary by the Engineer. The weighing conveyor shall be equipped with a self-cleaning system to eliminate weighing errors. The belt conveyor shall be set at the tension recommended by the manufacturer.

A positive interlocked automatic shutoff shall be provided so that the plant will shut down automatically after a 15 second delay or if there is a disruption in the flow of aggregate.

A vibratory scalping screen of adequate size and capacity shall be provided to remove oversize material from the combined cold feed belt. Provision shall be made to divert the aggregate passing the vibrating screen to allow sampling by the Department or it representative. Monitoring probes shall be installed to monitor the moisture in the aggregate.

5.1.3.3 PGAB Distribution. The PGAB delivery system shall be equipped with a flow switch which shall automatically stop the plant if any interruption occurs in the flow of PGAB. A temperature correction device shall be used to compensate for the specific gravity of the PGAB. The system shall be equipped with a bypass to permit weighing and calibration.

5.1.3.4 Calibration. The Contractor shall have competent personnel available to calibrate and maintain all electronic, electrical and mechanical controls.

The Contractor shall maintain at the plant a copy of the manufacturer's manual which contains the method of calibrating which shall be used to perform the initial calibration after assembly and prior to production. The calibration of the plant shall be carried out under the supervision of the Department or its Representative.

Generally initial calibration shall consist of cold feed and PGAB metering pump calibration. Each cold bin shall be calibrated separately by diverting the flow from the bin into a properly tared truck. The PGAB metering pump shall be calibrated by diverting the flow into a tared tank truck.

Graphs shall be prepared for each bin showing the flow in tonnes per hour (tph) (moisture corrected) plotted against the plant readout for the variable speed motors. A graph shall also be prepared showing the tph of PGAB plotted against the plant readout for the pump.

When an aggregate source is changed, the cold feed system shall be calibrated. At the start of each day the assembly shall be stabilized. A known mass shall be placed on the weighing conveyor to verify the plant readout. During production, the moisture content of each aggregate in the cold feed bins shall be

determined before noon and also after noon. Changes will be made in the plant settings due to changes in moisture. Adjustments shall be made until all plant settings agree with design tph and the tph from the calibration graphs.

5.1.3.5 Production. The Contractor shall supply to the Project Engineer at the project pre-job meeting, the asphalt plant manufacturer's specification for each individual plant;

- the specified rate of production in tonnes per hour versus aggregate moisture content, the Contractor shall adhere to the manufacturer's production rates
- the specified location of the PGAB delivery pipe within the drum of the asphalt drum mix plant
- production will not commence until the location of the PGAB delivery pipe is verified by visual inspection at the start of the paving season or as deemed necessary by the Department
- deviations from the manufacturer's specification will not be permitted

The aggregate shall be sufficiently dried as evidenced by the lack of noticeable steaming and bubbling of the asphalt concrete, and by the absence of any visible free water seepage from the storage silo, or the truck bodies. If any of these conditions are evident it shall be cause for rejection of the asphalt concrete.

A system for diverting unacceptable material shall be provided between the drum and the storage silo or surge bin. The moisture content of the asphalt concrete at discharge shall be determined daily and shall not exceed 0.5%. The temperature of asphalt concrete shall be automatically recorded.

5.1.3.6 Storage. Drum mix plants shall be equipped with either a silo or a surge bin, capable of delivering a homogenous, non-segregated and non-contaminated asphalt concrete into the trucks. Silos shall be maintained at least half full and be equipped at the top with a tripping hopper. The silo shall be equipped with a device to indicate if the silo is half full.

The tripping hopper shall be coordinated with plant production and shall close before complete discharge to prevent any free fall of asphalt concrete into the silo. Storage in the silo up to 20 hours shall be permitted provided that the penetration of the PGAB recovered from the stored asphalt concrete is equal to or greater than the penetration after the thin film oven test of the original PGAB before mixing and also the temperature remains such that the asphalt concrete does not arrive at the paver below 125°C.

5.2 Loading, Transporting, Unloading. Asphalt concrete shall be discharged from the plant into truck bodies using a minimum of three drops to fill the body. The truck shall be repositioned between drops such that the first drop is toward the front of the box, the second drop is toward the rear of the box, and the third drop is in the middle.

At no time shall the asphalt concrete be allowed to trickle through the surge bin or silo into the truck body. Asphalt concrete shall be transported from the paving plant to the work site in vehicles with smooth metal bodies, free from leaks and previously cleaned of all foreign materials. Vehicles shall be equipped with tarpaulins of water repellant material with a maximum mesh size of 0.5 mm when stretched, a minimum melting point of 200°C and of sufficient size to completely cover truck bodies from edge of box to edge of box and overlap the tailgate. Tarps shall be in good condition and shall have no holes or tears. The tarps shall be securely tied down so there is no visible opening between the truck box and tarp. Vehicles shall also be equipped with wind deflectors at the front of the truck box. If it is raining or if the temperature of the asphalt concrete drops more than 10°C between the time of leaving the plant and placing on the road, tarpaulins shall be used. Tarpaulins shall be used at any other time at the Engineer's request.

The use of Hydrocarbon fuels or solvents to lubricate the truck bodies or to clean tools or equipment, will not be permitted. A biodegradable release agent shall be supplied by the Contractor to clean or lubricate tools, equipment and truck bodies.

Trucks will stop slightly ahead of the paver and the paver will move ahead and smoothly pick up the truck. To reduce segregation, prior to backing into the spreader the truck body shall be partially elevated before the tail gate is tripped to promote a mass of material deposited in the hopper.

5.3 Placing. Asphalt concrete shall be placed upon a prepared surface which is free from standing water and cleaned of all loose or foreign material.

On repaving projects, before placing of new pavement, the existing pavement shall be tacked as per Division 4, Section 1, Emulsified Asphalt. When the pavement has been left over the Winter, it shall be cleaned and tacked before new pavement is placed.

New pavement may be applied directly over a freshly placed mat without applying tack coat, such as when multiple lifts are being placed within the same construction season.

Placement shall not take place during rain, or when the surface is frozen, nor when the ambient temperature is below 5°C, unless otherwise directed by the Engineer.

The placing of asphalt concrete shall be at a constant and even rate of speed.

The spread rate for each lift shall not vary more than 15 kg/m^2 from that specified by the Engineer. The maximum spread rate allowed will be 135 kg/m^2 unless otherwise approved by the Engineer.

5.3.1 Mechanical Pavers & Their Operation. Unless otherwise permitted by the Engineer, the asphalt concrete shall be spread by a mechanical self-powered paver in good working condition capable of achieving the specified grade, line and crown.

Pavers shall be equipped with hoppers and reversing distributing screws to place the asphalt concrete evenly in front of adjustable screeds. The asphalt concrete shall be dumped in the centre of the hoppers such that no spilling occurs on the road surface. Any asphalt concrete spilled accidentally shall be shovelled from in front of the spreader and wasted or placed in the hopper. The hopper shall not be emptied to less than 25% of capacity while moving forward except when the spreading operation is being suspended (i.e. as the end of the day). Wings of the paver shall only be dumped when the asphalt concrete has built up so that a truck cannot be unloaded. Any cold or segregated material must be shovelled out and wasted.

Any segregated asphalt concrete in the hopper shall be shovelled out between truck loads and wasted. The distributing screws shall always be kept between 1/3 and 2/3 covered. Pavers shall employ equalizing runners, straightedge runners, even-arms and/or other compensating devices to adjust the grade and confine the edges of the asphalt concrete to the true lines without the use of stationary side forms. They shall be capable of spreading the asphalt concrete without segregation, to a thickness between 20 mm and 100 mm and in instances where a single paver is operating, that paver must be capable of continuous width adjustment. When paving in echelon one of the pavers must be capable of continuous width adjustment. Where a single paver is operating on a surface course, the width of paver shall be such that a longitudinal joint is not formed within a travel lane. The joints in the lower courses may be in the travelled lane but not directly in the wheel path. Longitudinal joints between courses shall be offset by a minimum of 300 mm.

Pavers shall be equipped with adjustable vibrating screeds which are capable of being heated and produce a minimum vibrating frequency of 3000 vibrations per minute or as specified by the manufacturer. They shall be equipped with a maintained strike-off bar or tamper. The tamper shall knead the coarse particles to prevent tearing or dragging of the mat. The vibrating screed, including extensions, will provide initial compaction and must form a consistent texture and grade and shall operate across the entire width of the mat.

Immediately after the asphalt concrete is spread and before rolling operations begin, the surface shall be inspected and any irregularities repaired and adjustments made to the screed. Irregularities in alignment and grade along the outside edge shall also be corrected before the edge is rolled.

Special attention shall be given to the straight edging of each lift following initial rolling.

Approved automatic screed controls shall be used to regulate longitudinal grade and transverse slope when spreading Type B, Type B-HF, Type C, Type C-HF or Type D-HF on Freeways and/or Arterials.

Automatic screed controls shall be used on Collector or Local roadways at the mutual agreement of the Engineer and Contractor or if specified in the Special Provisions.

All pavers must be equipped with automatic joint matchers which shall be used to match to the grade of a previously placed adjacent mat.

Automatic screed controls for the control of longitudinal and transverse slope and joint matching shall be as recommended or supplied by the manufacturer of the paver. When use of the longitudinal automatic screed control is specified the first lift shall be controlled as to grade by an approved 9 m ski or floating beam. For all subsequent lifts the paver shall match the previous lift by using the shoe designed for that purpose.

5.3.2 Spreading Alternatives. In narrow base widening, deep or irregular sections, intersections, turnouts, or driveways, where it is impractical to use mechanical pavers to spread and finish the base, levelling or surface course, the Contractor may use other approved spreading equipment (graders etc.) or hand methods as directed by the Engineer. When the asphalt concrete is to be spread by hand, it shall be dumped and then spread with lutes or rakes. The Contractor will not be permitted to use shovels to spread the asphalt concrete by broadcasting it over the surface. Any part of the asphalt concrete that has formed into lumps and does not break down easily shall be discarded. The rakers will not be permitted to stand on the hot asphalt concrete, except where necessary to correct errors in the first raking. The hand placement and raking shall be performed in such a manner that a minimum amount of patching will be required.

5.3.3 Joint Construction. All joints shall be well bonded to form a continuous seal.

5.3.3.1 Transverse Joints. Transverse joints shall be formed by butt joints. When forming butt joints, the edge of the previously placed asphalt concrete shall be cut back to its full depth so as to expose a fresh surface

after which it shall be coated with hot PGAB or tack coat or heated before fresh asphalt concrete is placed in contact with it. Heat shall be applied to the joint using a method approved by the Engineer with care taken not to overheat the existing asphalt concrete. The freshly placed asphalt concrete shall be raked to the proper depth and grade and then the transverse joints shall be rolled transversely (perpendicular to the travel lanes) and the compacted joint shall be inspected with a 3 m straightedge. If there is more than a 6 mm depression, the joint shall be reconstructed.

5.3.3.2 Keyed Joints. When overlaying existing asphalt concrete pavement, keyed joints (see Drawing HS404.DWG) shall be constructed at both ends of the Project repaved area, at all intersecting roads, ramps and at all bridge decks in the repaved area, to avoid a feather joint. Keys will only be required between the final lift of pavement and the existing pavement, unless otherwise directed by the Engineer.

The existing asphalt concrete pavement shall be removed to expose a vertical surface of a depth equal to the thickness of the final lift against which new asphalt concrete may be placed. The minimum slope measured parallel to the centre line of the milled area shall be 200 horizontal to 1 vertical (200H:1V). The angle that the joint makes with the centerline shall not exceed forty five (45°) degrees or as otherwise directed by the Engineer.

When existing pavement has been removed in advance of paving the joint area, the Contractor shall construct a smooth taper at the joint area to a slope of at least 50 horizontal to 1 vertical (50H:1V). The taper may be placed on tar paper and shall be removed just prior to paving the keyed area or as directed by the Engineer. The transverse joint shall be straight and have a vertical face when the taper is removed.

The associated cost of providing all keys shall be included in the price per tonne of asphalt concrete.

The paver shall not move more than 20 m from any transverse joint until that joint has been rolled and checked with a straight edge. If the joint is not satisfactory it shall be immediately corrected before the paver may proceed.

5.3.3.3 Longitudinal Joints

5.3.3.3.1 Paving in Echelon

5.3.3.3.1.1 Paving / New Construction. Pavers shall be used in echelon to lay the mat full width. The pavers shall follow one behind the other so closely that cooling of the longitudinal joints between the mats is not permitted.

Adjacent mats must be completed to provide for exposed joint edges of maximum length of 100 m at the end of each day.

5.3.3.3.1.2 Pulverization / Repaving Projects. Pavers may be used in echelon to lay the surface full width, when practical, when traffic can be diverted and when production of the mixture can be maintained. The pavers shall follow one behind the other so closely that cooling of the longitudinal joints between the mats is not permitted.

Adjacent mats must be completed to provide for exposed joint edges of maximum length of 100 m at the end of each day.

5.3.3.3.2 Conventional Paving

5.3.3.3.2.1 Construction When not Paving in Echelon. Prior to placing the adjacent mat, the exposed edge of each longitudinal joint must be coated with emulsified asphalt (tack coat).

The material being placed in the abutting lanes shall be tightly crowded against the vertical face of the previously placed lane. The paver shall be positioned so that in spreading, the material overlaps the lane previously placed by 25 to 50 mm and should be left sufficiently high to allow for compaction. The width and depth of the overlapped material shall be kept uniform at all times.

The longitudinal joints may be constructed such that the freshly placed asphalt concrete may be humped by the back of the rake or lute which shall permit the roller to force and compact the asphalt concrete into the previously placed lift. During construction of the longitudinal joint, the rakers will not rake the coarse particles over the freshly placed asphalt concrete. Any surplus of coarse particles shall be wasted.

When constructing a joint near any adjoining edge that the spreader cannot reach, any spaces left open shall be filled by hand with asphalt concrete. This may be humped with the back of a rake or lute to a proper height as to receive maximum compaction.

Longitudinal joints in the top lift shall not be constructed within a travel lane except when paving in echelon or when paving tapers. Lower mats may have joints in the lane but not in the wheel path. Joints in succeeding lifts shall be offset a minimum of 300 mm.

Adjacent mats must be completed to provide for exposed joint edges of maximum length of 100 m at the end of each day.

In no case, shall a section of longitudinal joint be left exposed for greater than three (3) hours, that is, the adjacent mat must be placed along any section of previously placed mat within three (3) hours. The exception to the foregoing is the short (100 m or less) strip that may be exposed at the end of the day.

5.3.4 Placing Rate. Placing shall proceed in a continuous and steady manner. The paver speed shall therefore be regulated to the rate of plant production, however, placing must be at such a rate to provide for a satisfactory finish and specified compaction.

Ordinarily, there shall not be more than five (5) trucks waiting to unload ahead of the spreader.

5.4 Compacting and Finishing. The minimum density acceptable shall be 94% of the Theoretical Maximum Relative Density determined according to ASTM D 3203. The percent compaction shall be determined by comparing the core densities with the theoretical maximum relative density.

5.4.1 Rolling Operations - General. Compaction of the asphalt concrete shall be with any combination of rollers that can achieve the specified smoothness and density except that when compacting Type B-HF or Type C-HF, a pneumatic tired roller shall be used in the train. Also, there shall be at least one pneumatic tired roller in the train when it is determined specified compaction cannot be obtained or surface texture and smoothness acquired.

The Contractor shall demonstrate a rolling pattern for achieving compaction at the start of paving operations and the degree of compaction will be verified by the Department. This rolling pattern shall be maintained unless a change is approved by the Engineer.

When ending a pass, the roller shall turn to one side to avoid leaving a depression perpendicular to the centerline.

To avoid depressions in the asphalt concrete, rollers shall not be permitted to park on the hot mat.

All pneumatic tired rollers shall be skirted when air temperature is 10°C or lower or at the Engineer's request. When thin lifts are being placed, particularly if the air temperature is 10°C or lower, the plant production shall be reduced to allow for specified compaction procedures.

5.4.1.1 Rollers - General. Rollers shall be in good condition, capable of reversing direction without backlash and they shall be operated by competent and trained operators. The speed of steel wheeled rollers and pneumatic rollers shall not exceed 5 km/h and 8 km/h, respectively. The speed shall be slow enough to avoid displacement of the asphalt concrete. Any displacement occurring as a result of reversing the direction of the roller, or from any other cause shall be corrected. Rolling shall proceed continuously until all roller marks are removed and the specified compaction is achieved. Water or a biodegradable release agent shall be used on the roller wheels or tires to prevent adhesion of asphalt concrete. Hydrocarbon fuels or solvents shall not be permitted. Pneumatic tired rollers shall have a minimum mass of 3.5 t/m of width of tread. Vibratory rollers shall be capable of operating at a frequency of 2000 impacts per minute. The Department may use a tachometer to inspect the vibration frequency of each roller.

5.4.1.2 Number of Rollers. The minimum number of rollers to be supplied by the Contractor shall be as shown below unless the Contractor is able to achieve the required density, surface texture, and smoothness with fewer rollers.

Plant Output, t/h	Rollers (minimum)
80	2
120	3
180	4
240	5
300	6

5.4.1.3 Breakdown Rolling. Breakdown rolling shall begin when the asphalt concrete can withstand the mass of the roller without excessive displacement. Delays in rolling will not be tolerated. Rolling shall start longitudinally at the lower side or unsupported edge and proceed towards the centre of the mat, overlapping on each successive pass, by at least one half of the width of the drum. Alternate passes shall be of varying lengths. At unsupported edges, the roller shall cover the edge, but shall not overhang the edge by more than 150 mm.

5.4.1.4 Secondary Rolling. Secondary rolling shall follow the breakdown rolling as closely as possible while the asphalt concrete is still viscous enough to achieve the specified compaction.

5.4.1.5 Final Rolling. Final rolling shall be performed while the asphalt concrete is still viscous enough to permit the removal of roller marks.

5.4.1.6 Vibratory Rolling. Vibratory rollers shall be operated at a travel speed and vibration frequency to produce a minimum of 25 impacts per metre. Vibratory rollers will be used at the low amplitude setting, unless compaction cannot be achieved in which case the high amplitude setting will be used provided it does not cause ripples in the surface. Vibratory rollers shall be equipped with a device to provide for automatic shut off of vibration before the roller comes to a stop.

Vibratory compaction shall not be used on bridge decks.

5.4.1.7 Compaction Near Structures. Along curbs, headers, manholes and other structures not accessible to the roller, compaction must be obtained by employing suitable tampers or compactors.

5.4.2 Surface Finish. The surface, after final rolling shall be smooth and true to the established crown and grade.

All defective areas shall immediately be repaired by removing the asphalt concrete and replacing it with the same type of hot mix asphalt concrete used in that particular lift as per the specifications.

The surface shall be free from roller marks or any depressions exceeding 6 mm when measured with a 3 m straight edge held parallel to the centerline.

The surface shall have a cross slope of 20 mm/m to 35 mm/m as specified by the Engineer (in areas of normal crown).

5.5 Illumination. Asphalt concrete shall be transported, spread and compacted during daylight hours unless artificial light satisfactory to the Engineer is provided.

5.6 Temperature of Asphalt Concrete. Asphalt concrete exceeding a temperature of 165°C at any point of the operation shall be cause for rejection.

5.7 Co-ordination. All Aspects of the operation shall be co-ordinated such that production, transportation, placing and compaction shall be in a steady and continuous manner.

5.8 Segregation, Damage, Contamination. Segregation, damage or contamination of the asphalt concrete shall not be permitted whether it occurs in the stockpiles, mixing drum, conveyors, silos, surge bins, discharge chute, trucks or spreader or any other equipment. Segregated material shall be removed immediately as soon as it becomes apparent at any stage of the operation. Areas of segregated, damaged or contaminated material shall be removed to the full depth of the lift and repaired, to the satisfaction of the Engineer, at the Contractor's expense.

Equipment shall <u>not</u> be refuelled on the new asphalt concrete.

6.0 QUALITY CONTROL / QUALITY ASSURANCE

6.1 Inspection. The Department will have a representative at the site of aggregate production, at the asphalt plant site and on the road. The Contractor is responsible to provide free and safe access to the site(s) to permit the Department's representative to carry out required duties.

The Contractor shall supply an inspection facility both at the aggregate production site and asphalt plant site for the Department's representative and at the Contractor's expense. The location of this facility shall be close to the plant or production site which allows a clear view of the operation and shall be in an environmentally acceptable area. At the aggregate production site and the asphalt plant site, a reservoir of 100 L. of water suitable for performing tests shall be supplied. At the asphalt plant site an electrical connection will be supplied.

6.1.1 Inspection Quarters - Asphalt Plant.

- outside dimension - 2400 mm x 4270 mm (minimum)
- walls and ceiling to be insulated
- one 920 mm door with window and lock
- two windows, (minimum 700 mm x 600 mm) shall open

Furniture, Equipment, Utilities

- one air conditioner
- base board heat
- electricity capable of supporting electronic equipment, air conditioning unit, heat, ignition oven (30 amp 220 volt) etc.
- exhaust fume hood for ignition oven
- two overhead lights
- one sink draining into holding tank
- one bench A along 4270 mm wall -- dimension 760 mm wide by 900 mm high. One bench B along 2400 mm wall - dimension 760 mm wide by 900 high (shall be of sturdy construction and well supported).
- five wall plugs - three plugs located on bench A and two plugs on bench B
- steps providing safe access
- supply of water for testing purposes (not necessarily to be running water)
- two chairs

6.1.2 Inspection Quarters - Aggregate Production Site.

- outside dimension 2 m x 2 m minimum
- one door
- one window
- one bench
- one chair
- supply of water for testing purposes

6.2 Sampling and Testing of Aggregate

6.2.1 Minimum Production Prior to Sampling. The Department will sample and test the proposed sources according to ASTM D 75 after 1000 t of aggregate have been stockpiled (500 t of coarse and 500 t of fine) ASTM C 136 and ASTM D 546.

6.2.2 Testing During Production. In pits where aggregate is being produced during construction, the aggregate shall be continuously sampled and tested according to ASTM D 75, ASTM C 136 and ASTM D 546.

6.2.3 Testing Stockpiled Aggregate. In high volume operations such as in a quarry where at least 3000 t of stockpile already exist, the aggregate in the stockpile shall be sampled and tested as per ASTM D 75, C 136 and D 546.

6.2.4 Aggregate Sampling for Stripping Test. Sampling of aggregates for the stripping test shall be as outlined in Subsections 6.2.1, 6.2.2 and 6.2.3.

6.3 Sampling PGAB. All QA samples shall be a minimum size of one litre and shall be taken from the Contractor's storage tank in accordance with ASTM D 140 by the Contractor. An additional set-aside sample shall be taken by the Contractor in the event an appeal test is required. The random number information pertaining to the hot mix tonnage at which the PGAB is required to be sampled shall be supplied by the Department.

The Department will verify the sampling, package and transport all samples (including set-aside samples) for QA testing.

7.0 METHOD OF MEASUREMENT

The Contractor shall, at their expense, provide, install and maintain such approved scales and all suitable facilities as may be required to enable the Engineer to determine accurately the weight of asphalt concrete loaded into each truck.

8.0 BASIS OF PAYMENT

8.1 General. Asphalt concrete will be paid for at the contract unit price per tonne for the Asphalt Concrete actually incorporated and accepted in the work which price shall be full compensation for furnishing of all materials (except the supply of PGAB), heating, handling, transporting, mixing, placing and rolling of all materials, the supplying of all equipment, plant, labour and incidentals necessary to complete the work.

The unit price per tonne will be subject to adjustments if specified in the Special Provisions (example smoothness). Aggregate in stockpile will be paid for under the conditions and at the rate indicated in the Special Provisions.

8.2 Hauling of Blend Sand. The hauling of blend sand will be paid for if the blend sand is required when the design procedure contained in Subsection 3.2 has been followed. The amount of blend sand eligible for haul payment shall be the actual percentage of blend sand used on a daily basis, or up to 10%. Haul rates to be paid shall beTPW rates, up to a maximum haul distance of 75 kms. Documentation showing the actual haul rates and distances shall be provided to the Engineer.

9.0 WARRANTY

SECTION 7 - ASPHALT CONCRETE PATCHING

1.0 DESCRIPTION

Asphalt concrete patching shall consist of the supply and placement, by hand or machine, of asphalt concrete under the following conditions:

- Repair or replace asphalt concrete within the limits and to the grade of existing asphalt concrete surface (ie. pot holes, cross-cuts for culverts).
- Correct depressions in the existing asphalt concrete surface in "isolated areas". Isolated areas shall be defined as individual sections less than 300 m^2 (ie. sags, areas of wheel rutting).
- On repaving contracts, match (blend) existing pavement outside the normal edge of roadway to the grade of the new asphalt concrete surface. (ie. driveways but not to include intersections with public roads).
- On paving contracts, match new asphalt concrete surface to the existing pavement outside the normal edge of roadway. (ie. driveways).
- On paving or repaving contracts contracts prior to the application of a leveling or surface course, match the grade of the existing asphalt concrete surface where the match strip is less than 3 m in width. (ie. matching the edge of pavement to new curb or to an additional lane or new ramp).

2.0 REFERENCES

All reference standards shall be current issue or latest revision at the first date of tender advertisement. This specification refers to the following standards, specifications or publications:

- Division 4 Section 1, Emulsified Asphalt
- Division 4 Section 4, Asphalt Concrete-Hot Mixed-Hot Placed

3.0 SUBMISSIONS AND DESIGN REQUIREMENTS

4.0 MATERIALS

5.0 CONSTRUCTION METHODS

Prior to placing the hot mix patching material, the areas of the existing pavement shall be tack coated with RS-1 conforming to Division 4 Section 1.

Asphalt Concrete, Type B, Type B-HF, Type C or Type C-HF conforming to Division 4 Section 4, shall be used for Asphalt Concrete Patching. The Contractor shall place Asphalt Concrete Patching by machine, wherever possible, at the discretion of the Engineer to ensure a smooth, uniform surface after compaction.

6.0 QUALITY CONTROL/QUALITY ASSURANCE

7.0 METHOD OF MEASUREMENT

The quantity of Asphalt Concrete Patching for which payment will be made shall be the number of tonnes of asphalt concrete placed and accepted by the Engineer.

8.0 BASIS OF PAYMENT

Asphalt Concrete Patching will be paid for at the contract unit price per tonne for the Asphalt Concrete actually incorporated and accepted in the work, which price shall be full compensation for furnishing of all materials (except the supply of asphalt cement) blend sand, heating, handling, transporting, mixing, placing, and rolling of all materials, the supplying of all equipment, plant, labour, and incidentals necessary to complete the work.

The Contractor shall, at his own expense, provide, install and maintain such approved scales and all suitable facilities as may be required to enable the Engineer to determine accurately the mass of Asphalt Concrete loaded in each truck.

9.0 WARRANTY

SECTION 9 - DELETED

SECTION 10 - DELETED

SECTION 12 - SEAL COAT - (EPWS)

1.0 DESCRIPTION

This item consists of the supply and construction of all single seal coat and double seal coat and warrant the work for one year. The type of seal coat used shall be as specified in the Special Provisions.

1.1 Types of Seal Coats. There are two types of seal coats, defined as:

Type A: Single Seal Coat - The Contractor shall apply a single seal coat surface treatment consisting of a single application of polymer-modified emulsified asphalt and Gradation SC-1 aggregate.

Type B: Double Seal Coat - The Contractor shall apply a double seal coat which shall consist of an application of emulsified asphalt followed by a single application of SC-3 aggregate, a second application of emulsified asphalt, and a single application of SC-2 aggregate on a prepared and primed surface.

2.0 REFERENCES

All reference standards shall be current issue or latest revision at the first date of tender advertisement. This specification refers to the following standards, specifications or publications:

- ASTM C 127, Test Method for Specific Gravity and absorption of Coarse Aggregate
- ASTM C 131, Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
- ASTM D 5, Test Method for Penetration of Bituminous Materials
- ASTM D 244, Test Methods for Emulsified Asphalts
- ASTM D 2042, Test Method for Solubility of Asphalt Materials in Trichloroethylene
- ASTM D 2415, Test Method for Ash in Coal Tar and Pitch
- ASTM D 4791, Flat and Elongated Particles
- Division 1 Section 3 Subsection 6, Agreement
- Division 4 Section 11, Crack Filling and Crack Sealing
- DOT&PW TM-2, Modified Petrographic Analysis
- DOT&PW Traffic Control Manual

3.0 SUBMISSIONS AND DESIGN REQUIREMENTS

3.1 Seal Coat Design. The Contractor shall be responsible for all aspects of the mix design.

For information purposes only a copy of the design shall be submitted to the Engineer two weeks before the work proceeds. Any changes in the design shall be forwarded to the Engineer within one working day.

4.0 MATERIALS

4.1 Supply of Materials. The Contractor shall supply all materials for the execution of the work.

4.2 Aggregate. The cover aggregate shall be produced from a quarried source and shall be washed (where required) and free from thin or elongated particles, clay, wood fragments or other deleterious matter.

The seal coat aggregate shall comply with the following gradation and physical requirements:

Table 4.2.1 - Gradation of Seal Coat Aggregate

Sieve Designation	Cumulative Percent Passing		
	SC-1	SC-2	SC-3
20 000			100
14 000	100	100	40 - 80
10 000	96 - 100	40 - 90	20 - 62
6 300	0 - 43		
5 000	0 - 10	0 - 20	0 - 20
2 500	0 - 3	0 - 8	0 - 10
1 250	0 - 0.5		
80	0 - 0.3	0 - 3	0 - 3

Table 4.2.2 - Physical Properties of Seal Coat Aggregate

Property	Test Method	Aggregate
Absorption, % Max	ASTM C127	1.75
LA Abrasion, %Max	ASTM C131	35
Flat & Elongated % Maximum	ASTM D4791	20
Petrographic No	DOT&PW	135 (A) 150 (B)

4.3 Polymer-Modified Emulsified Asphalt. For Type A, single seal coat application, a polymer-modified emulsified asphalt, CRS-2P shall conform to the requirements specified in Division 4 Section 1 of these specifications.

4.4 Emulsified Asphalt. For Type B, double seal coat application, the emulsified asphalt shall be HF-150s or HP-200 and conform to the requirements specified in Division 4 Section 1 of these specifications.

4.5 Primer. For Type B, double seal coat application, the primer shall be liquid asphalt conform to the requirements specified in Division 4 Section 5 of these specifications.

5.0 CONSTRUCTION METHODS

5.1 General

5.1.1 Traffic Control. Traffic control shall be in accordance with the latest edition of the Department's "Temporary Workplace Traffic Control Manual" for the class of road to be seal coated.

5.1.2 Weather Limitations. The Department reserves the right to direct the Contractor to discontinue seal coating operations when, in the opinion of the Engineer or representative, weather creates conditions dangerous to the travelling public.

5.1.3 Limits of Work. The seal coat shall be constructed to a width as directed by the Engineer or as specified in the Special Provisions.

5.1.4 Limitations on Advancement. The maximum distance seal coating of a travel lane may proceed ahead of seal coating of an adjacent travel lane shall be 3 km on undivided highways and 4 km on divided highways.

5.2 Equipment. The Contractor shall supply all tools, machinery and equipment in satisfactory working condition at all times to ensure a high quality product.

The Department reserves the right to order the discontinuance of use of any equipment or method of operation which in the opinion of the Engineer, or representative, endangers the travelling public.

5.3 Construction Sequence, Type A Single Seal Coat

5.3.1 Surface Preparation. Any asphalt concrete patching required shall be completed at least three weeks prior to commencement of the seal coat operation. Cracks shall be sealed or filled in accordance with Division 4 Section 11.

5.3.2 Application of Polymer-Modified Emulsified Asphalt. The Contractor shall apply the polymer-modified emulsified asphalt to the existing surface at the application rate determined by the Contractor.

The Contractor shall take necessary action to ensure that structures, curbs, guardrail and other such surfaces shall not be coated with polymer-modified emulsified asphalt. The Contractor shall remove any over spray caused by his operation. Any areas that are to receive an application of polymer-modified emulsified asphalt that are not sprayed shall be corrected. Emulsified asphalt shall not be spilled, sprayed or tracked on completed sections of seal coat. Bridge expansion joints shall be protected with building paper.

5.3.3 Application of Aggregate. The Contractor shall apply the aggregate to the surface at the application rate determined by the Contractor.

5.3.4 Brooming. The Contractor shall broom all treated areas as often as necessary following completion of the work until final acceptance as specified in Subsection 9.2 is obtained to reduce the possibility of flying seal coat aggregate.

The Department reserves the right to order the Contractor to broom the seal coated surface should persons or property be subject to unsafe conditions or damage as a result of loose seal coat aggregate.

5.4 Construction Sequence, Type B Double Seal Coat. The double seal coat shall be applied in the sequence noted herein.

5.4.1 Priming. The Contractor shall apply prime to the prepared surface at the application rate determined by the Contractor. All priming operations shall be performed in accordance with Division 4 Section 5 of these specifications.

The newly primed surface shall be allowed to cure.

5.4.2 Application of Blotter Sand. If the prime does not penetrate the base or is subject to pickup by traffic, a crusher dust or fine sand shall be applied. The dust/sand shall be uniformly applied by means of a spreader. The Contractor shall re-prime any bare areas.

5.4.5 Emulsified Asphalt - Initial Course. After the primed surface has been prepared, the Contractor shall apply an emulsified asphalt at the application rate determined by the Contractor.

5.4.6 Aggregate Initial Course. The Contractor shall apply grading "C" aggregate to the prepared surface at the application rate determined by the Contractor.

5.4.7 Emulsified Asphalt - Final Course. After the initial course has been completed, the Contractor shall apply emulsified asphalt at the application rate determined by the Contractor.

5.4.8 Aggregate Final Course. The Contractor shall apply grading "B" aggregate to the completed initial course surface at an application rate determined by the Contractor.

5.4.12 Brooming - Final Course. Brooming shall be as specified in Section 5.3.4.

5.4.13 Blotter Sand. A crusher dust or fine sand shall be made available for use as a blotting agent should the seal be affected by a sudden rainstorm.

6.0 QUALITY CONTROL / QUALITY ASSURANCE

6.1 Quality Control. Quality control testing shall be the responsibility of the Contractor throughout every stage of the work including the production of the aggregates and polymer-modified emulsified asphalt, primer and emulsified asphalt and/or high-float emulsions, to the design and placement of the final product.

The Contractor shall provide the Engineer with a copy of all quality control test results within 24 hours of testing.

6.2 Quality Assurance. During the progress of the work, quality assurance testing may be conducted by the Department or its representative to ensure compliance with the specifications.

Results of the quality assurance testing will be available to the Contractor within 24 hours.

Quality assurance testing performed by the Department or its representative will not be considered to be quality control testing. Sampling and testing necessary to perform quality assurance monitoring will be at no cost to the Contractor.

7.0 METHOD OF MEASUREMENT

The quantity for payment shall be the area of accepted work as measured along the lineal grade of the roadway.

8.0 BASIS OF PAYMENT

The contract bid price per square meter of accepted seal coat shall be full compensation for the supply, handling, transportation, mixing and placing of all materials including polymer-modified emulsified asphalt, primer, emulsified asphalt and/or high-float emulsion (initial and final course), aggregates (single and/or double coats), blotter aggregate and the supply of all equipment, plant, labour, tools, designs, quality control, traffic control and incidentals necessary to complete the work, as herein specified.

The contract bid price shall also include any other work such as additional signing, brooming, etc., required to protect the traveling public until the final maintenance period has expired and the work receives final acceptance by the Department.

9.0 WARRANTY

Opening to traffic does not constitute acceptance of the work and the Contractor shall remain responsible for all claims and the quality of the work until final acceptance of the work by the Department

9.1 Requirements for Initial Acceptance of the Work. The completed seal coat will be accepted and a one year maintenance period will begin when the following requirements have been met:

- a minimum of 99% coverage has been obtained with no single bare area greater than 0.01 m^2 in any one square metre; and
- there is no streaking or raveling; and
- the surface of the seal has a uniform, even texture; and
- no over-rich or bleeding areas are evident; and
- no deficiencies in workmanship exist.

Seal coat that does not meet the foregoing requirements shall be repaired using compatible materials. All repair or reconstruction cost including, but not limited to, materials, hauling, placing, traffic control, etc., shall be at the Contractor's expense.

Initial acceptance of the work will be given to the Contractor by the Engineer in writing indicating the date of acceptance.

9.2 Final Acceptance. The Department or its representative, and the Contractor shall meet and inspect the seal coat one year after the completion of the work. Poor stone retention, and flushing or bleeding of the surface shall be recognized as failure.

More specifically, the Department recognizes failure has occurred if one of the following conditions exist:

- less than 97% seal per 100 m section of roadway remains; or
- any individual bare area greater than 0.06 m^2 exists; or
- greater than 5 m total length of over-rich or bleeding, area(s) per lane per 100 m section of roadway exists.

All areas that have failed shall be repaired at the Contractor's expense. Any engineering expenses incurred by the Department for these repairs shall be withheld from funds otherwise payable to the Contractor.

Based on the aforementioned criteria to determine

failure, if the Contractor and the Department do not agree on what areas are failed, the Department's decision shall be final.

Final acceptance of the original seal coat by the Department shall relieve the Contractor from all maintenance responsibilities, however, the Contractor shall be held responsible to maintain repaired areas for a period of 12 months after repairs are made.

9.3 Liability. During the one year maintenance period the Contractor shall be responsible for processing any and all claims for property damage and/or bodily injury caused by flying aggregate from the work site including, but not limited to, motor vehicle or pedestrians. The Contractor shall be responsible for the payment of all property damage and bodily injury claims and shall indemnify and save harmless the Minister from and against all claims, demands, loss, costs, damages, actions, suits or other proceedings by whomsoever made, brought or prosecuted in any manner based upon, occasioned by or attributable to flying aggregate from the work site or otherwise from the performance of this agreement by the Contractor or his servants or agents. Any such third party claim which is not finalized in a prompt and efficient manner may be finalized by the Department and where this is done the Contractor shall reimburse the Department for any reasonable and necessary payment made to finalize the claim.

9.4 Security Deposit. Notwithstanding anything to the contrary, and as stated in Division 1 Section 3 Subsection 6 of these specifications, the security deposit for this contract shall be held and retained by the Minister until the one-year maintenance period has expired. The security deposit shall be held to ensure that sufficient funds will be available to the Department in the event of non-performance by the Contractor. The Contractor shall be responsible for all costs including the materials and haul and for the repair of all failures, traffic control and damages resulting from negligence or faulty workmanship by the Contractor that adversely affects the integrity of the seal coat surface which occurs and is evident prior to the expiration of the one year maintenance period.

SECTION 16 - MICRO-SURFACING - (EPWS)

1.0 DESCRIPTION

Micro-surfacing shall include both surface and rut fill application unless otherwise specified.

Micro-surfacing shall consist of the maintenance and application of a homogeneous mixture of cationic polymer modified emulsified asphalt, mineral aggregate, mineral filler, water and other additives to the existing pavement surface.

2.0 REFERENCES

All reference standards shall be current issue or latest revision at the first date of tender advertisement. This specification refers to the following standards, specifications or publications:

- ASTM D36, Test Method for Softening Point of Bitumen
- ASTM D244, Test Methods for Emulsified Asphalts
- ASTM D2170, Test Method for Kinematic Viscosity of Asphalts
- ASTM D2397, Specification for Cationic Emulsified Asphalt
- ASTM D2419, Test for Sand Equivalent Value of Soils and Fine Aggregate
- ASTM E303, Method of Measuring Surface Frictional Properties Using British Pendulum Tester
- ISSA TB-100, Wet Track Abrasion Loss
- ISSA TB-109, Excess asphalt by LWT Sand Adhesion
- ISSA TB-113, Mix Time
- ISSA TB-114, Wet Stripping
- ISSA TB-139, Wet Cohesion
- ISSA TB-144, Classification Compatibility
- ISSA TB-147A, Lateral Displacement
- Division 1 Section 3 Subsection 6, Agreement
- Division 1 Section 4 Subsection 25, General Provisions
- DOT&PW Traffic Control Manual
- Federal Department of Consumer and Corporate Affairs

3.0 SUBMISSIONS AND DESIGN REQUIREMENTS

3.1 Mix Design. The Contractor shall designate the mix proportions and prepare the job mix formula. The aggregate and the polymer modified emulsified asphalt shall be assessed to confirm compatibility. The Contractor shall supply the results of a sand equivalency test for the aggregate.

All component materials used in the mix design shall be representative of the material proposed by the Contractor for use on the contract.

The Contractor shall submit to the Department the final mix design and the results of the tests listed in Table 4.16.1. The material shall not be placed until the Engineer has received the mix design.

Table 4.16.1 - Micro-Surfacing Mix Properties

Test Name	Standard	Requirement
Wet Cohesion @ 30 minutes min. (Set)	ISSA TB-139	Minimum 12 kg-cm
Wet Cohesion @ 60 minutes min. (Traffic)	ISSA TB-139	Minimum 20 kg-cm
Excess Asphalt by LWT	ISSA TB-109	Maximum 538 g/m^2
Wet Stripping	ISSA TB-114	Pass (90% min)
Wet Track Abrasion Loss, 1 Hour Soak	ISSA TB-100	538 g/m^2
Wet Track Abrasion Loss, 6 Day Soak	ISSA TB-100	807 g/m^2
Lateral Displacement	ISSA TB-147A	Maximum 5
Classification Compatibility	ISSA TB-144	AAA, BAA 11 Grade Points Min.
Mix Time @ 25°C	ISSA TB-113	Controllable to 120 Sec. Min
Sand Equivalency	ASTM D2419	65 Min

The micro-surfacing shall be designed so that traffic can be allowed on the surface within one hour.

4.0 MATERIALS

4.1 Polymer Modified Emulsified Asphalt (Binder). The binder shall be a quick set polymer modified cationic type CSS-1H emulsion or equivalent.

Emulsified asphalt and polymer modified asphalt shall be homogeneous after mixing and show no signs of separation within 14 days of delivery. The addition of polymers or other additives after the manufacture of the emulsified asphalt shall not be permitted.

The binder shall conform to the requirements of ASTM D 2397 for an emulsion, with the following amendments as detailed in Table 4.16.1.

Table 4.16.2 - Polymer Modified Emulsified Asphalt

Test Name	Standard	Requirement
Residue by Distillation, % by Mass	ASTM D244	Minimum 62%
Tests on Residue		
Softening Point	ASTM D36	Minimum 57°C
Penetration, (25°C, 100 g, 5 s), 0.1mm	ASTM D2397	40 - 90
Kenematic Viscosity @ 145°C	ASTM D2170	Minimum 650 mm^2/s

4.2 Aggregates. The aggregates shall consist of 100% crushed bedrock material.

4.2.1 Stockpiling. The Contractor shall construct stockpiles at sites of his own choosing. Such sites shall be arranged for, and shall be the responsibility of the Contractor, in all respects. Throughout the duration of the work there shall be sufficient aggregate in stockpile to cover three days production. If different sources of aggregate are to be used, separate stockpiles for each source are to be maintained.

The aggregates shall conform to the gradation requirements as detailed in Table 4.16.3.

Table 4.16.3 - Aggregate Gradation

Sieve Designation	Cumulative Percent Passing	Stockpile Tolerance, %
10 000	100	± 5
5 000	70-90	± 5
2 500	45-70	± 5
1 250	28-50	± 5
630	19-34	± 5
315	12-25	± 4
160	7-18	± 3
80	5-15	± 2

Once the gradation for the mix design has been submitted, the stockpile shall be within the tolerances shown under Stockpile Tolerances.

4.2.2 Sampling. The Department reserves the right to sample stockpiles to ensure the gradation conforms to that used in the mix design.

4.3 Mineral Filler. Mineral filler shall be free of lumps and shall not be air entrained.

4.4 Water. The water shall be potable and shall be free of harmful salts and contaminants.

4.5 Polymer Modifier. The polymer solids, along with special quick setting emulsifier agents shall be milled into the emulsified asphalt at the colloid mill.

The polymer modifier shall consist of a minimum of 3% polymer solids by mass.

4.6 Additives. Additives may be added to the emulsion mix during construction to provide control of the quick-set properties and increase adhesion. They must be compatible with the other components of the micro-surfacing.

5.0 CONSTRUCTION METHODS

5.1 General

5.1.1 Weather Limitations. The Contractor shall be responsible for determining under what weather conditions work on this contract may proceed. The

Department, however, reserves the right to direct the Contractor to discontinue micro-surfacing operations when, in the opinion of the Engineer or selected representative, weather conditions endanger the traveling public.

5.1.2 Documentation. The Contractor shall submit to the Engineer, at the beginning of each working day, a written summary of the total quantity and distribution rate of micro-surfacing placed the previous day which shall include a list of the quantities used of each of the components; aggregate, emulsion, cement and additive.

5.1.3 Protection of Work and Traffic Control. The Contractor shall be responsible for providing traffic control required to protect the work zone and to ensure the safe passage of traffic in conformance with the DOT&PW Traffic Control Manual or as directed by the Engineer. Traffic control shall include traffic control persons, pilot vehicles with operators, signing and all other labour, equipment and material, excluding the supply of signs.

The Contractor shall be responsible for ensuring that the mixture is not damaged by traffic.

Traffic, including construction traffic, shall be kept off the freshly placed mixture for whatever time is required to prevent damage to the surface and until premarking of traffic lines with paint is complete.

5.1.4 Trial Area. At the commencement of the micro-surfacing operation the Contractor shall demonstrate the ability to produce and place micro-surfacing by placement of a trial area 100 m in length and one lane in width.

5.1.5 Appearance. The finished micro-surfacing shall have a uniform texture free from excessive scratch marks, tears or other surface irregularities. Tear marks in any 12 m^2 per-lane are considered excessive if there are:

- four or more marks 12 mm wide or wider and 100 mm or more long;
- any marks 25 mm wide or wider and 25 mm or more long.

There shall be no longitudinal ripples (raking) and wash-boarding (chatter) of 5 mm or more in depth as measured with a 3 m straight edge, or other irregularities that will affect the ride quality.

The edges of the micro-surfacing for surface application shall be uniform with neat appearance along the roadway centerline, lane lines, shoulder, pavement edge, and curb lines. Edges shall have no more than ± 50 mm horizontal variance in any 30 m section.

The finished surface shall be uniform and achieve a minimum British Pendulum Number (PDN) of 45 as measured with the British Pendulum Tester in accordance with ASTM E 303.

5.1.6 Joints. The longitudinal and traverse joints shall be neat and uniform in appearance. No excessive buildup, uncovered areas, non-homogeneous mixture or unsightly appearance shall be permitted on longitudinal or transverse joints.

The longitudinal joints in the scratch coat shall be constructed as a butt joint. The longitudinal joints in the surface course shall be placed on lane lines with less than 100 mm overlap on adjacent passes, except where pavement width varies ie. ramps and tapers, and no more than 6 mm difference in elevation between the adjacent passes as measured with a 3 m straight edge.

Transverse joints shall be constructed with no more than 6 mm difference in elevation across the joint as measured with a 3 m straight edge.

5.2 Equipment.

5.2.1 Brooms. Power brooms shall be capable of cleaning gravel, sand, dirt and other debris from bituminous surfaces shall be used.

5.2.2 Mixing Equipment. The machine shall be specifically designed and manufactured to place micro-surfacing. The material shall be mixed by an automatic sequenced, self-propelled micro-surfacing mixing machine, which shall be a continuous flow mixing unit, able to accurately deliver and proportion the aggregate, emulsified asphalt, mineral filler, control setting additive, and water to a revolving multi-blade double shaft mixer and discharge the mixed product on a continuous flow basis. The machine shall have sufficient storage capacity for aggregate, emulsified asphalt, mineral filler, control additive and water to maintain an adequate supply to the proportioning controls.

5.2.3 Proportioning Devices. Individual volume or weight controls for proportioning each material to be added to the mix (ie. aggregate, mineral filler, emulsified asphalt, additive, and water) shall be provided and properly marked. These proportioning devices are usually revolution counters or similar devices and are used in material calibration and determining the material output at any time.

5.2.4 Calibration of Proportioning Devices. Prior to beginning placement of micro-surfacing, the Proportioning Devices shall be calibrated. A copy of the results of the calibration must be given to the Engineer prior to any micro-surfacing operation.

Over the duration of the work, the Proportioning Devices shall be re-calibrated, should the following occur:

- After every 2000 t of aggregate placed throughout the duration of the contract.
- A change in the source of aggregate from that used in the previous calibration.
- Mechanical failure to the application system and/or Proportioning Devices in which repair is required.

5.2.5 Straight Edges. A 3 m straight edge shall be available that may be used to check for cross fall.

5.2.6 Spreading Equipment. The mixture shall be spread uniformly by means of a conventional augured surfacing spreader box attached to the mixing machine and equipped with paddles to agitate and spread the material evenly throughout the box. A front seal shall be provided to ensure no loss of the mixture at the pavement contact point. The rear seal shall act as final strike-off and shall be adjustable. The spreader box and rear strike-off shall be so designed and operated that a uniform consistency is achieved to produce a free flow of material to the rear strike-off. The spreader box shall have suitable means provided to maneuver the box to compensate for variations in the pavement geometry.

The rut filling spreader box shall be specifically designed for rut filling applications.

5.2.7 String line. A String line or other device must be provided to ensure the longitudinal edges are straight and meet the existing pavement edge or as directed by the Engineer.

5.3 Construction Sequence

5.3.1 Surface Preparation. The area to be surfaced shall be thoroughly cleaned of all vegetation, loose material, sand, dirt and other debris. Dried mud or other foreign matter, which cannot be removed with the rotary power broom, shall be removed by hand blade or other approved method. Water, if required, shall be applied to pre-wet the surface and immediately ahead of the spreader at a rate to dampen the surface without allowing any freestanding or free flowing water.

5.3.2 Tack Coat The area to be surfaced shall be covered with tack coat. The tack coat should consist of one part cationic polymer emulsified asphalt and three parts water and will be applied with a standard distributor. The distributor shall be capable of applying the dilution evenly at a rate of 0.16 to 0.32 litres per square metre. The tack coat shall be allowed to cure sufficiently before the application of Micro-Surfacing.

5.3.3 Application. The mixture shall be spread to fill minor cracks and shallow potholes and leave a uniform surface. The application shall consist of a scratch coat and a surface coat with a combined minimum application rate of 14 kg/m^2.

Existing ruts greater than 10 mm shall be filled by separate application of micro-surfacing, with a rut filling spreader box, prior to the surface application.

Rut Fill Only application shall be specified where only the rut is to be filled with no surface application to follow. The mixture shall be confined to the immediate area of the rutting or as directed by the Engineer. Edges shall be feathered to blend into the existing cross slope.

Filled ruts shall have no depression. Overfill of ruts shall not exceed 3 mm per 25 mm of rut depth filled as measured with a 3 m straight edge.

For both types of application a sufficient amount of mixture shall be carried in all parts of the spreader box at all times so that complete coverage is obtained. Water may be sprayed into the spreader box to facilitate spreading without harming the mix. No lumping, balling, or unmixed aggregate shall be permitted in the finished surface. Any oversized aggregate or foreign materials shall be screened from the aggregate prior to delivery to the mixing machine.

5.3.4 Handwork. In restricted areas where hand spreading is necessary, slight adjustments to the mix formula may be used to retard the setting time. The mixture shall be poured into a small windrow along one edge of the surface to be covered. The mixture shall be spread uniformly with squeegees or other suitable hand tools.

5.3.5 Rolling. The micro-surfacing shall be rolled at the discretion of the contractor.

5.3.6 Clean-Up. All areas, such as shoulders and gutters, shall have the micro-surfacing mix removed as specified by the Engineer. The Contractor shall, on a daily basis, remove any debris associated with the performance of the work.

6.0 QUALITY CONTROL / QUALITY ASSURANCE

6.1 Quality Control. Quality control testing shall be the responsibility of the Contractor throughout every stage of the work, from and including, the production of the aggregates and polymer modified asphalt emulsion to the design and placement of the final product.

The Contractor shall provide the Engineer with a copy of all quality control test results within 24 hours of testing.

6.2 Quality Assurance. During the progress of the work, quality assurance testing may be conducted by the Department or its representative to ensure compliance with the specifications.

Results of the Quality Assurance testing will be available to the Contractor within 24 hours.

Quality Assurance testing performed by the Department or its representative shall not be considered to be quality control testing. Sampling and testing necessary to perform quality assurance monitoring will be at no cost to the Contractor.

7.0 METHOD OF MEASUREMENT

The method of measurement and payment shall be based on the area covered, measured in square metres.

8.0 BASIS OF PAYMENT

8.1 Micro-Surfacing. Payment for this item will be at the contract unit price per square metre of surface application.

Payment shall be full compensation for the supply, handling, transporting, mixing and placing of all materials, including tack coat and rut filling, the supplying of all equipment, plant, labour, incidentals and traffic control necessary to complete the work.

9.0 WARRANTY

9.1 Initial Acceptance. Initial acceptance of the work will be made provided all of the following conditions are met:

9.1.1 Bleeding and Flushing. The total of areas exhibiting bleeding and flushing shall not exceed two percent in any 100 m^2 area. No bleeding at the joints shall be permitted.

9.1.2 Surface loss (debonding, delamination and/or potholing). The total of areas exhibiting loss of surface shall not exceed two percent in any 100 m^2 area.

9.1.3 Raking and Chatter. The total of areas exhibiting raking and chatter shall not exceed two percent in any 100 m^2 area.

9.1.4 Ruts. The total of areas exhibiting ruts exceeding 6 mm below grade, as measured with a 3 m straight edge, shall not exceed two percent in any 30 m lane segment. The warranty period for rutting shall be sixty (60) days after placement has been accepted by the Engineer. The warranty period shall apply to both initial placement and repairs.

9.1.5 Surface Friction. At the end of the maintenance period the surface shall have a uniform texture and a minimum BPN of 45 as measured with the British Pendulum Tester in accordance with ASTM E 303.

9.2 Maintenance / Repair Period

Upon completion of the Micro-Surfacing and visual acceptance of the work in accordance with these specifications, a two year maintenance period will begin. During this period any failure in the Micro-Surfacing, including but not limited to raking, chatter, raveling, potholes, delamination, debonding, over rich or bleeding areas shall be repaired or reconstructed at the Contractor's expense to the satisfaction of the Engineer. Any 400 m lane segment that has defects exceeding five percent of the area shall require a reapplication of micro-surfacing over the entire segment. All material, haul and related work required for reconstruction of unacceptable areas shall be paid by the Contractor.

At the discretion of the Engineer, any failure in the Micro-Surfacing within the first 12 months of the maintenance period, deemed to be a hazard to traffic, shall be repaired by the Contractor immediately.

9.3 Final Acceptance. The Department or its representatives, and the Contractor will meet and inspect the Micro-Surfacing prior to the expiration date of the two year maintenance period.

Based on the aforementioned criteria for initial acceptance, if the Contractor and the Department do not agree on what areas are failed, the Department's decision shall be final. All areas that have failed shall be repaired at the Contractor's expense at no cost to the Department.

The final acceptance of the original Micro-Surfacing by the Department shall relieve the Contractor from all

maintenance responsibility with respect to the original Micro-Surfacing, however, the Contractor shall be held responsible to maintain repaired areas for a period of 12 months after repairs are made.

9.4 Liability. During the period of construction and the two year maintenance period the Contractor shall be responsible for processing any and all claims for property damage and/or bodily injury caused by failure of the Micro-Surfacing including but not limited to motor vehicle or pedestrians. The Contractor shall be responsible for the payment of all property damage and bodily injury claims and agrees to save and hold harmless the Department from all such claims as set out in Division 1 Section 4 Subsection 25 of these specifications. Claims not handled by the Contractor or representative efficiently or expediently will be settled by the Department and the costs recovered from the Contractor.

9.5 Security Deposit. Notwithstanding anything to the contrary, and as stated in Division 1 Section 3 Subsection 6 of these specifications, the security deposit for this contract shall be held and retained by the Minister until the maintenance period has expired. The security deposit will be held to ensure that sufficient funds will be available to the Department in the event of non-performance by the Contractor who is responsible for all costs including the materials and haul and for the repair of all failures and damages resulting from negligence or faulty workmanship by the Contractor that adversely affects the integrity of the Micro-Surfacing which occurs and is evident prior to the expiration of the two yea. maintenance period. The amount of security deposit shall be approximately 20% of the estimated value of the tender.

SECTION 19 - ASPHALT CONCRETE END PRODUCT SPECIFICATION (EPS)

1.0 DESCRIPTION

This item consists of supplying crushed aggregates, blending materials, anti-stripping agent, asphalt binder, production, loading, hauling, placing and compaction of hot mix asphalt concrete, including asphalt concrete patching. The limits of placement, application rates and the asphalt concrete mixture type shall be as stated in the contract specifications. Areas constructed will be subjected to various quality assurance testing.

It shall be the Contractor's responsibility to provide an acceptable product as specified. In order to achieve this, the Contractor shall implement and maintain a quality control system that will provide assurance that all components, as well as end result products, submitted to the Department for acceptance, conform to the contract requirements. This is without regard to whether the products are manufactured by the Contractor or purchased from suppliers or subcontractors.

Quality assurance tests shall be performed, by the Department, on random samples taken either at the production site or laydown site.

1.1 DEFINITIONS

1.1.1 End Product Specification (EPS). An end product specification is a specification under which the Department monitors the Contractor's control of the processes that produce the items of construction. The Department accepts or rejects the end product according to a specified quality assurance plan. The Contractor is entirely responsible for quality control. End product acceptance is the responsibility of the Department including a statistically oriented program of quality assurance testing.

1.1.2 Design Mix Formula (DMF). The DMF is defined as the laboratory determination of the precise proportions of asphalt binder, additives and aggregates to be blended together to meet the specified properties for a given asphalt concrete mix.

1.1.3 Job Mix Formula (JMF). The JMF is the resultant establishment of the single definite percentage for each sieve fraction of aggregate and asphalt binder content that will produce the desired asphalt concrete mix properties under field conditions.

1.1.4 Actual Asphalt Binder Content. This is the percentage of asphalt binder in the asphalt concrete mixture, determined from quality assurance testing in accordance with ASTM D3607.

1.1.5 Lot. For each mixture type specified, a Lot is defined as the quantity of asphalt concrete plant production, totaling 2400 tonnes, where approved changes to the Job Mix Formula have not occurred. For loose samples, each Lot shall be divided into 4 (four) approximately equal segments and one loose sample is taken from each segment. For core samples, each Lot shall be divided into 5 (five) approximately equal segments and one core sample is taken from each segment.

If it is the last time the mix is produced and this criterion cannot be met (i.e. less than 2400 tonnes of mix remain), the following shall apply:

- If the remaining plant production is 600 tonnes or less, 1 (one) random loose sample will be obtained and the production will be added to the previous Lot. 5 (five) random core samples will be obtained from the new Lot tonnage.
- If the plant production is more than 600 tonnes, but less than 2400 tonnes, 4 (four) random loose samples will be obtained and the production will be designated as a separate Lot. 5 (five) random core samples will be obtained from this Lot.

A separate Lot will be established at the discretion of the Engineer if conditions of construction indicate that it is likely that a portion of the Lot production is significantly different from the remainder of the Lot production.

1.1.6 Stratified Random Sample. A stratified random sample is defined as a representative sample taken in an unbiased manner, by dividing a Lot into approximately equal segments. A random sample is taken from each area or segment.

1.1.7 Sample Mean. This is the arithmetic mean of the group of test results derived from the randomly selected samples.

1.1.8 Mean of the Deviations. This is the sum of the absolute values of the deviations divided by the number of tests in the Lot.

1.1.9 Thickness. Thickness is defined as the specified application rate indicated in the contract documents divided by the average bulk relative density obtained from the core samples for a given Lot.

1.1.10 Mix Property. Mix properties measured for product acceptance and price adjustments are as follows:

- Gradation: p5000, p80, Asphalt Binder Content, Thickness, Density and Smoothness.

2.0 REFERENCES

All reference standards shall be current issue or latest revision at the first date of tender advertisement. This specification refers to the following standards, specifications or publications:

- Division 4 Section 1, Emulsified Asphalt
- Division 4 Section 2, PGAB
- Division 4 Section 4, Asphalt Concrete Hot Mixed-Hot Placed - 4.3 Anti-Stripping Agents
- Occupational Health and Safety Act
- Environmental Protection Act
- 1981 Asphalt Paving Plant Regulations
- AASHTO T 283, Resistance of Compacted Bituminous Mix to Moisture Induced Damage
- AASHTO TP 33, Test Method for Uncompacted Void Content of Fine Aggregate, Method A
- ASTM C 88, Test Method for Soundness of Aggregates by use of Sodium Sulfate or Magnesium Sulfate
- ASTM C 117, Test Method for Material Finer Than 75µm (No. 200) Sieve in Mineral Aggregates by Washing
- ASTM C 127, Test Method for Specific Gravity and Absorption of Coarse Aggregate
- ASTM C 128, Test Method for Specific Gravity and Absorption of Fine Aggregate
- ASTM C 131, Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
- ASTM C 136, Method for Sieve Analysis of Fine and Coarse Aggregates
- ASTM C 207, Specification for Hydrated Lime
- ASTM D 75, Practices for Sampling Aggregates
- ASTM D 140, Practice for Sampling Bituminous Materials
- ASTM D 995, Specification for Requirements for Mixing Plants
- ASTM D 1559, Test Method for Resistance to Plastic Flow of Bituminous Mixes Using Marshall Apparatus
- ASTM D 2041, Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixes
- ASTM D 2172, Test Method for Quantitative Extraction of Bitumen From Bituminous Paving Mixes
- ASTM D 2419, Test Method for Sand Equivalent Value of Soils and Fine Aggregate
- ASTM D 2726, Test Method for Bulk Specific Gravity of Compacted Bituminous Mixes Using Saturated Surface-Dry Specimens
- ASTM D 2950, Test Method for Density of Bituminous Concrete in Place by Nuclear Method
- ASTM D 3203, Standard Test Method for Air Voids in Compacted Bituminous Paving Mixes
- ASTM D 3549, Test Method for Thickness or Height of Compacted Bituminous Paving Mix Specimens
- ASTM D 3665, Practice for Random Sampling of Construction Materials
- ASTM D 4791, Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
- ASTM D 5361, Practice for Sampling Compacted Bituminous Mixes for Laboratory Testing
- ASTM D 5444, Test Method for Mechanical Size Analysis of Extracted Aggregate
- ASTM D 6307, Test Method for Asphalt Content of Hot-Mix by Ignition Method
- ASTM E 178, Standard Practice for Dealing with Outlying Observations
- DOT&PW TM-2, Test Method for Modified Petrographic Analysis
- DOT&PW TM-3, Test Method for Percent Fractured Particles in Processed Coarse Aggregate
- DOT&PW TM-4, Test Method for Moisture in Asphalt Mixes
- DOT&PW TM-5, Test Method for Obtaining Loose Asphalt Concrete Mix Samples

3.0 SUBMISSIONS AND DESIGN REQUIREMENTS

3.1 Establishing a Design Mix Formula (DMF). Preparation and submission of the asphalt DMF for the Department's approval is the responsibility of the Contractor. The Contractor shall use professional engineering services and a qualified testing laboratory, to assess the aggregate materials proposed for use and to carry out the design of the asphalt concrete mix.

3.1.1 Requirements for Design Mix Formula. The asphalt mix design shall follow the Marshall method of the DMF as outlined in the latest edition of the Asphalt Institute Manual Series No. 2 (MS-2). The mix design, at the design asphalt binder content, shall meet the requirements in Table 1 for each asphalt concrete mix specified.

3.1.2 Submission of Design Mix Formula. The Contractor's submission shall include the following information/materials:

- The specific gravity and the percentage by mass of each aggregate (including natural sand, lime) to be used in the mix.
- The mix design gradation of the combined aggregate (including natural sand, lime).
- Physical properties of the aggregates specified, in accordance with Table 1.
- All Marshall mix design characteristics, including graphs used in arriving at the final mix design, the bulk relative density of the combined aggregates, and the asphalt absorption of the combined aggregates.
- Pit identification consisting of its name, name of owner, public highway from which it is accessed.

Accompanying the design mix formula documentation, the following materials shall also be submitted for verification testing by the Department.

- Samples of the aggregate: 40 kg of each coarse aggregate, 40 kg of each fine aggregate, 20 kg of natural sand, and if necessary - 10 kg of lime or 1

liter of liquid anti-stripping agent.
- Additional samples are required in order to calibrate the ignition oven: 18 kg of each coarse aggregate, 18 kg of each fine aggregate, 6 kg of natural sand and 2 liters/mix of PGAB
- A sample of the PGAB (2 litres/mix)

3.1.3 Evaluation of Design Mix Formula. The Engineer will require up to seven (7) working days from the time of receipt of the DMF, for evaluation by the Department representative's laboratory. The Engineer will advise the Contractor of the acceptability. If the DMF does not meet the requirements of Table 1, it shall be rejected. The Engineer shall provide a written explanation to the Contractor that details why the DMF failed. The Contractor shall then provide another complete DMF in accordance with 3.1.1 Requirements for Design Mix Formula, and re-submit it to the Engineer for evaluation. Each time a DMF is re-submitted, an additional seven (7) working days, from the time of receipt of the revised DMF, shall be required for evaluation by the Department representative's laboratory.

The Engineer will not accept any asphalt concrete mix produced prior to the Contractor receiving written approval of the DMF from the Engineer.

3.2 Establishing a Job Mix Formula (JMF). The Contractor shall establish a JMF for each mix type by placing a specified quantity of trial mix (asphalt concrete) at a location designated by the Engineer. The maximum allotted quantity of asphalt concrete allowed for establishment of the JMF is as follows:
- Base Course: 600 tonnes
- Surface Course: 300 tonnes
- Alternatively, the Contractor may elect to waive their trial mix option and submit their JMF (and supporting documentation) directly to the Engineer for approval.

At the discretion of the Engineer, the Contractor may be permitted to carry over any unused portion of the base course allotment to supplement the surface course allotment.

The asphalt concrete placed in the trial sections will be tested to determine if it meets the requirements of Table 1, however, unit price adjustments and repair/replace/reject criteria will be applied to the Thickness and Density properties. The asphalt concrete shall be assessed for surface defects in accordance with 6.3.8 Surface Defects.

3.2.1 Approval of Job Mix Formula. The Contractor shall submit the JMF in writing to the Engineer for approval. The Contractor's submission shall include the following information:
- The percentage by mass of each aggregate (including natural sand, lime) to be used in the mix
- The JMF target asphalt binder content and gradation
- The % Air Voids, VMA and VFA from the trial mix

The Engineer's written approval of the JMF will allow the Contractor to start/continue production. Rejection of the JMF shall require the appropriate action based on the Engineer's assessment.

3.2.2 Field Adjustments to the Job Mix Formula. A field adjustment to the JMF is defined as a change in the target gradation and/or asphalt binder content of a mix, within specified limits, without a redesign of the mix.

The Contractor shall request JMF changes in writing, including supporting test results (a minimum of 3 sets of QC results as per 3.2.1 Approval of Job Mix Formula). Upon approval by the Engineer, revisions to the JMF will be applied to subsequent Lots only.

For each mix type on the contract, the maximum allowable number of field adjustments to the JMF for gradation and asphalt binder content parameters, shall be based on the following:

Tender Quantity for Specified Mix (tonnes)	Maximum Number of JMF Changes per Parameter
0 - 10000	2
10000 - 15000	3
15000 - 20000	4
20000 - 25000	5
25000 - 30000	6

The Contractor shall submit a revised DMF in accordance with 3.1.1 Requirements for Design Mix Formula, for the following changes:
- A change in the source of the aggregate used in the asphalt concrete mix.
- A change in material (different aggregate sizes) from the same source.
- A change in the source of the liquid anti-strip additive used in the asphalt concrete mix.

The submission of a revised DMF is not required for a change in the source of the asphalt binder. However, documentation from the Contractor identifying the change is required.

4.0 MATERIALS

4.1 Performance Graded Asphalt Binder (PGAB). PGAB shall be supplied by the Contractor, in accordance with the Standard Specification Division 4, Section 2. Specific PGAB grade requirements will be denoted in the contract specifications.

Within 7 (seven) calendar days prior to the first use of PGAB products, the Contractor shall supply to the Engineer, a Quality Control Plan detailing the quality control activities related to the use of PGAB.

4.2 Coarse Aggregate. Coarse aggregate supplied by the Contractor shall be made from a quarried source and shall conform to the requirements stated in Table 1. Coarse aggregate shall be the portion retained on the 5 000 sieve, free from coatings of clay, silt or other deleterious material.

4.3 Fine Aggregate. Fine aggregate supplied by the Contractor shall be produced from a quarried source or in the case of a natural deposit, fine aggregate may be manufactured from the aggregate held on the 10 000 sieve. In such cases, a tolerance of 10% passing the 10 000 sieve, based on a washed sieve analysis, will be permitted. Fine aggregate shall be the portion passing the 5000 sieve and shall meet the physical requirements of Table 1.

4.4 Natural Sand. If required, natural sand shall be supplied by the Contractor. Natural sand shall be used to obtain acceptable physical mix properties as outlined in Table 1. The maximum amount of natural uncrushed fine aggregate, used shall be limited to 15% of the total aggregate in all mix types.

4.5 Blending of Coarse Aggregates. Blending of coarse aggregates from two sources will only be permitted when the Petrographic Number (PN) for the aggregate from the original (primary) source does not exceed the specified PN by more than 10%. The PN of the aggregate from the secondary (blending) source shall not exceed the specified PN limit. The PN of the combined sources shall not exceed the specified PN limit.

The minimum amount of secondary (blending) coarse aggregate shall be at least 10% of the stone fraction. Coarse aggregates shall be blended through the cold feed bins (i.e. coarse aggregates from different sources shall be introduced into the mix through individual cold feed bins).

Sand from the original source may be used, provided the stone from which the sand is produced has a PN not more than 10% higher than the specified PN.

TABLE 1
Asphalt Concrete Mix Requirements

Sieve Designation	B-HF	C-HF	D-HF
	% (by mass) Passing Each Sieve		
28 000	100	-	-
20 000	95-100	100	-
14 000	70-90	95-100	100
10 000	60-75	-	70-90
5 000	35-58	45-68	52-75
2 500	25-45	25-55	25-55
315	3-20	5-20	5-20
80	2-6.5	2-6.5	2-7
Physical Requirements for Asphalt Concrete	**B-HF**	**C-HF**	**D-HF**
Marshall Stability kN (min)	7.5	7.5	7.5
No. of Blows	75	75	75
Air Voids % * (1)	3.5-4.5	3.5-4.5	3.5-4.5
VMA % (min)	13	14	15
Voids Filled with Asphalt %	65-78	65-78	65-78
Marshall Flow, mm	2-4	2-4	2-4
Stripping Test, % (min)	73	73	73

Physical Requirements for Coarse Aggregate	B-HF	C-HF	D-HF
Los Angeles Abrasion, % (max)	35	35	35
Soundness, % (max)	15	15	15
Petrographic No. (max)	135	135	135
Flat & Elongated Particles, % (max)	10	10	10
Fractured Particles, Two fractured faces, % by mass (min)	95	95	95
Absorption % (max)	1.75	1.75	1.75
Physical Requirements for Fine Aggregate	**B-HF**	**C-HF**	**D-HF**
Absorption, % (max)	2.0	2.0	2.0
Soundness, %(max)	10	10	10
Fine Aggregate Angularity, % (min)	45	45	45
Sand Equivalent, % (min)	50	50	50

* (1) During mix production, Air Void requirement is 3.0 - 5.0 %.

4.6 Anti-Stripping Agents. If the Contractor elects to use anti-stripping agents, the incorporation of such products into the asphalt concrete mix shall be done in accordance with the Standard Specification Division 4 Section 4. Anti-stripping agents shall consist of one of the following:

- Hydrated Lime ($Ca(OH)_2$)
- Liquid Anti-Stripping Agent

5.0 CONSTRUCTION METHODS

5.1 General. Equipment shall be designed and operated to produce an end product complying with the requirements of this specification. Equipment used shall be of adequate rated capacity and shall be in good working order.

5.2 Production. The asphalt mixing plant and its components shall meet the requirements of ASTM D 995 and the latest edition of the Standard Specification.

Asphalt concrete exceeding a temperature of 165°C at any point of the operation shall be cause for rejection.

5.3 Transportation. Asphalt concrete shall be transported from the paving plant to the work site in trucks that are properly equipped and in good working order.

The use of hydrocarbon fuels or solvents to lubricate the truck bodies or to clean tools or equipment, will not be permitted. A biodegradable release agent shall be supplied by the Contractor to clean or lubricate tools, equipment and truck bodies.

The Contractor shall not place asphalt concrete during rain, or when the surface is frozen, nor when the pavement surface shows signs of free-standing water or when the ambient temperature is below 5°C.

5.4. Placement. Asphalt concrete shall be placed upon a prepared surface which is free from standing water and free of any loose or foreign material. The asphalt concrete shall be spread by a mechanical self-powered paver capable of achieving the specified grade, line and crown.

Placement of asphalt concrete shall only be conducted during daylight hours, unless specifically noted otherwise in the contract specifications.

Contact edges of existing mats and contact faces of curbs, gutters, manholes, sidewalks and bridge structures shall be coated with a thin film of tack before placing the asphalt concrete.

Failed areas in existing surfaces (paved or gravel) shall be repaired, as directed by the Engineer. Areas requiring repair will be identified by the Engineer in consultation with the Contractor. Irregularities in the horizontal alignment and grade along the outside edge of the asphalt concrete shall be corrected by the addition or removal of mix before the edge is rolled. Paving of intersections, extra widths and other variations from standard lane alignment and as defined in the contract, whether by hand spreading or machine laying, shall be carried out concurrently with the machine laying operation of the regular mat, unless otherwise approved by the Engineer.

Fuel spills from the Contractor's equipment shall be immediately repaired by the Contractor to the

satisfaction of the Engineer.

5.5 Joint Construction. All joints shall be constructed to ensure a dense, well-bonded, continuous seal and to provide a smooth riding surface.

5.5.1 Transverse Construction Joints. Transverse joints shall be butt joints constructed at the end of each day's work and at other times when paving is halted for a period of time which results in the asphalt concrete cooling to below 120°C. When paving resumes, temporary tapers or ramps from previously placed asphalt concrete shall be cut back to full mat thickness to expose fresh, straight vertical surfaces. Loose or broken material shall be removed and surfaces tacked, at the Contractors expense, in accordance with the latest edition of the Standard Specification.

5.5.2 Longitudinal Construction Joints. Longitudinal joints in the top lift shall not be constructed within a travel lane except when paving in echelon or when paving tapers. Base course mats may have joints located within the lane, but not in the wheel path. Joints in succeeding lifts shall be offset a minimum of 150 mm.

5.5.2.1 Paving in Echelon. Where described in the contract specifications, pavers shall be used in echelon to lay the mat full width. Upon completion of each day's paving, the maximum length of exposed joint edge shall be 100 meters.

5.5.2.2 Conventional Paving. Prior to placing the adjacent mat, the exposed edge of each longitudinal joint must be coated with emulsified asphalt (tack coat). Upon completion of each day's paving, the maximum length of exposed joint edge shall be 100 meters.

5.5.3 Keyed Joints. When overlaying existing asphalt concrete pavement, keyed joints shall be constructed at both ends of the project, at all intersecting roads, ramps and at all bridge decks in the repaving area, as per the latest edition of the Standard Specification - Division 4, Section 4 (also see Drawing HS404.DWG Section 8). Keyed joints will only be required between the final lift of pavement and the existing pavement, unless otherwise directed by the Engineer.

When existing pavement has been removed in advance of paving the joint area, the Contractor shall construct a temporary (hot mix asphalt concrete ramp) taper at the joint area to a slope of at least 50 horizontal to 1 vertical (50H:1V), as per the latest edition of the Standard Specification - Division 4, Section 4 (also see Drawing HS404.DWG Section 8). Temporary tapers (ramps) shall be installed immediately following milling of the keyed joint and prior to opening the area to traffic.

5.6 Compaction. Compaction equipment shall consist of at least one of each of the following:

- vibratory roller
- pneumatic-tired roller
- finish roller

Along curbs, manholes and similar structures and locations not accessible to full size rollers, the mix shall be compacted with smaller compaction equipment, such as vibrating plate tampers, or by hand tampers.

5.7 Surface Defects. The finished surface of any pavement course shall have a uniform texture and be free of visible signs of defects. The Engineer will identify any obvious defects and determine remedial requirements, which may include removal and replacement in accordance with 6.5.1 Removal and Replacement. Such defects shall include, but not necessarily be limited to, the following:

- Segregated areas;
- Areas of excess or insufficient asphalt binder;
- Roller marks, tire marks;
- Cracking or tearing;
- Improper matching of longitudinal and transverse joints;
- Sampling locations not properly reinstated;
- Improper cross slope;
- Fuel spills on the mat;
- Deleterious materials.

6.0 QUALITY CONTROL / QUALITY ASSURANCE

6.1 Quality Control. The Contractor shall be totally responsible for quality control testing in accordance with Table 2, throughout every stage of the work from the crushing and production of aggregates to final product acceptance, to ensure materials and workmanship comply with the requirements of this specification. At no time, will the Engineer issue instructions to the Contractor as to setting of dials, gauges, scales and meters. However, the Engineer may advise the Contractor against the continuance of any operations or sequences of operations which will result in non-compliance with specification requirements.

The Contractor shall also be responsible for Quality Control testing of asphalt concrete patching mix used within the limits of the Contract. Asphalt concrete patching mix shall not be considered as part of a Lot, however, QC records and documentation shall be made available in accordance with 6.1.2 Sampling and Test Results.

6.1.1 Quality Control Inspection Testing Plan (ITP). Following award of Contract, and at least 10 (ten) working days prior to commencement of asphalt concrete aggregate production, the Contractor shall submit, in writing to the Engineer, an ITP covering all pheses of the contract performance, including the name of the party retained to prepare the ITP.

The ITP shall include, but not be limited to, identification and description of inspection and required test procedures to be used to fulfill the conditions of the

Contract. The ITP shall be sufficiently comprehensive and detailed to assure the Engineer of the Contractor's willingness and ability to control the construction production and processes. Once accepted by the Engineer the plan becomes a part of the Contract and shall be enforced accordingly.

If the Contractor elects to take loose samples from the roadway, the ITP shall describe the sampling procedure in sufficient detail to ensure that a minimum area is affected. The method used to reinstate the sample area must be outlined such that the resulting mix is uniform, non-segregated, and well compacted. Test methods, sampling and minimum frequency of testing are shown in Table 2.

The Engineer will provide written approval of the ITP within 5 (five) working days of receiving the same. The Contractor may be required to update and resubmit the ITP to the Engineer for approval, as conditions warrant.

6.1.2 Sampling and Test Results. Where specified, random sampling procedures shall be followed, and where no specific random sampling procedure is specified, the sampling procedure shall be as identified by the Contractor in the ITP. The Contractor shall be responsible for the interpretation of the test results and the determination of any action to be taken to ensure that all materials and work conform to the requirements of the Contract.

The Contractor shall notify the Engineer 24 hours in advance of profilograph testing. The profilograph equipment, testing and price adjustment schedule shall be in accordance with Appendix "F" of the Standard Specification.

The Contractor shall record the profilograph results on a "Profile Index Summary" form and submit the report to the Engineer within 4 (four) weeks of the completion of all field testing. Profile Index (PRI) measurements shall be reported to the nearest 0.1 mm. Individual deviations shall be reported to the nearest 0.5 mm. All profilograph graphical printouts (tapes) shall be printed in duplicate and signed off (initialized) by the Engineer at the time of testing. One copy shall be retained by the Engineer at the time of testing.

The Contractor shall maintain all QC records and documentation. Results of all QC testing carried out in accordance with Table 2 shall be provided to the Engineer within 24 hours of sampling. All QC documentation shall also be made available for inspection by other Department personnel at all times during the course of the Contract.

At the end of the construction season, and no later than December 31 in the year in which the Contract is completed, the Contractor shall provide the Engineer with a final report detailing all quality control test data. The report shall be provided on CD ROM (in Lotus or Excel format). A copy shall also be provided to the Department's Technical Services Division, Miller Lake.

Table 2
Quality Control Testing Requirements

Series	Tests	Standard	Minimum Frequency
A	**Aggregate Characteristics**		
	1. Sampling	ASTM D 75	
	2. Sieve Analysis	ASTM C 117, C 136	Preliminary Testing & Series B
	3. Soundness ($NaSO_4$)	ASTM C 88	Preliminary Aggregate Tests
	4. Los Angeles Abrasion	ASTM C 131	Preliminary Aggregate Tests
		TPW - TM2	Preliminary Aggregate Tests
	5. Petrographic No.	ASTM D 4791	Preliminary Testing & Series B
	6. Flat & Elongated Particles (4:1)		
	7. Specific Gravity and Absorption, Coarse Aggregate	ASTM C 127	Preliminary Aggregate Tests
	8. Specific Gravity and Absorption, Fine Aggregate	ASTM C 128 (1)	Preliminary Aggregate Tests
	9. Fine Aggregate Angularity	AASHTO TP 33 (A)	Preliminary Testing & Series B
	10. Sand Equivalent	ASTM D 2419	Preliminary Testing & Series B
	11. Fractured Particles	TPW - TM3	Preliminary Testing & Series B
	12. Stripping Test	AASHTO T283 (visual by TPW)	Preliminary Aggregate Tests (mix design)
	13. Absorption	ASTM C 127	Preliminary Aggregate Tests

(1) p80 material shall be removed prior to determining the specific gravity of the fine aggregate.

Series	Tests	Standard	Minimum Frequency
B	**Aggregate Production**		
	1. Sampling	ASTM D 75	
	2. Sieve Analysis (Crushed)	ASTM C 136 & C 117	2 coarse & fine agg./lot
	3. Sieve Analysis (Natural Sand)	ASTM C 136 & C 117	One per 300 tonnes
	4. Fractured Particles (Coarse)	TPW - TM 3	One per 1000 tonnes
	5. Flat & Elongated (Coarse)	ASTM D 4791	One per 5000 tonnes
	6. Fine Aggregate Angularity	AASHTO TP 33 (A)	One per 1000 tonnes
	7. Sand Equivalent	ASTM D 2419	One per 1000 tonnes
C	**Cold Feed**		
	1. Sampling	ASTM D 75	2 per lot
	2. Sieve Analysis (Combined Gradation)	ASTM C 136 & C 117	2 per lot
	3. Aggregate Moisture Content	ASTM D 2216	2 per day
	Hot Bin (Batch Plants)		
	1. Sampling		
	2. Sieve Analysis	ASTM C 136 & C 117	as required
D	**Plant Inspection**		
	1. Verification that Asphalt Cement Delivery Pipe location is in accordance with manufacturer's recommendations	ASTM D 995	Initial set-up, and following changes in plant configuration
	2. Asphalt Binder	Division 4 Section 2	Initial set-up, and following changes in plant configuration 1 per 5000 tonnes or 1 per lot
	Mix Testing		
	1. Mix Asphalt Binder Content	ASTM D 2172, ASTM 6307	3 tests per lot
	2. Extracted Aggregate Sieve Analysis	ASTM D 5444	3 tests per lot
	3. Mix Moisture Content	TPW - TM4	2 tests per lot
	4. Field Formed Marshall Briquettes	ASTM D 1559	3 tests per lot
	5. Flow & Stability	ASTM D 1559	1 per mix type
	6. Maximum Theoretical Density	ASTM D 2041	3 tests per lot
E	**Other Related Tests**		
	1. Bulk Relative Density	ASTM D 2726	Each core or briquette
	2. Void Calculations, Cores or Formed Specimens *(1)	ASTM D 3203	Each core or briquette
	3. Temperatures (plant and road)		5/day/location
	4. Sampling of Bituminous Mixes (for Compaction)	ASTM D 5361	3/lot
	5. Density of Bituminous Concrete (by Nuclear Methods)	ASTM D 2950	1 per hour
	6. Random Test Site Locations	ASTM D 3665	Each lot
	7. Correction Factors, Nuclear Moisture-Density Measurement	ASTM D 2950	Once per contract or as required
	8. Smoothness of Pavements	Std. Spec. Appendix F	Top Lift

Conditions may warrant an increase in the frequency of any of the quality control tests; the decision, arrangements and costs for which, are the responsibility of the Contractor.

***(1) If two consecutive air void results fall outside the specified limits, the Contractor shall stop production. Prior to continuing production, the Contractor shall provide the Engineer with written details of what measures have been taken to improve the properties of the mix. The Contractor shall not continue production until such time that the Engineer has issued written approval to do so. Failure on the part of the Contractor to adhere to this requirement, may result in the portion of the Lot affected being ineligible for payment.**

FOR SIEVE ANALYSIS ONLY: All sieve sizes referred to in ASTM Standards shall be replaced by the NSTPW equivalent sieve size as outlined in the latest edition of the Standard Specification.

6.2 Quality Assurance. Quality assurance (QA) is the responsibility of the Department. In addition to QA testing used to determine unit price adjustments, the Department may, at its sole discretion, examine, inspect or test any aspect of the Contractor's work as deemed appropriate. Such inspections and testing shall not relieve the Contractor of his responsibilities for quality control.

6.2.1 Sampling. Random sample locations (loose samples and core samples) for QA testing shall be generated by the Engineer for each Lot and trial mix. For the trail mix, a minimum of 1 (one) random loose sample shall be taken for QA testing (i.e. for determination of maximum theoretical density).

All QA samples shall be taken and labeled by the Contractor in the presence of the Engineer (or designated representative). Cores damaged during sampling or handling shall be discarded and new samples shall be taken immediately adjacent (within 0.3 meters) to the original sample location. The Engineer will be responsible for transporting the samples to the Department representative's laboratory.

Neither loose nor core samples will be taken from small areas such as tapers, aprons, bridge approaches, areas of handwork, gores, and asphalt mix used for isolated leveling and repair of failed areas, however, the tonnage contained therein will be included in the Lot.
Random samples will not be taken in areas of obvious surface defects as indicated in 5.7 Surface Defects. These areas will be marked and repaired in accordance with 6.5.1 Removal and Replacement.

6.2.2 Sample Testing. Unless otherwise specified, QA samples will be tested in accordance with the latest edition of the test methods outlined in Table 3.

Table 3
Quality Assurance Test Methods

Test Description	Test Method
Sampling Mixes	TPW - TM5
Coring	ASTM D 5361
Extraction	ASTM D6307
Sieve Analysis of Extracted Aggregate	ASTM D 5444
Bulk Relative Density	ASTM D 2726
Theoretical Maximum Relative Density	ASTM D 2041
Voids Calculations, Asphalt Concrete Specimens	ASTM D 3203
Percent Compaction, Asphalt Concrete Pavement	ASTM D 3203
Forming Marshall Specimens, Field Method	ASTM D 1559
Moisture Content Asphalt Concrete Mixes	TPW - TM4
Random Sampling of Construction Materials	ASTM D 3665
Thickness of Compacted Bituminous Materials	ASTM D 3549
Performance Graded Asphalt Binder (PGAB) Sampling	ASTM D 140
Stripping Test	AASHTO T283
FOR SIEVE ANALYSIS ONLY: All sieve sizes referred to in ASTM standards shall be replaced by the NSTPW equivalent sieve size as outlined in the latest edition of the Standard Specification.	

6.2.3 Asphalt Binder Content and Gradation. The asphalt concrete mix shall be sampled using the procedure as outlined in TPW - TM5 (revised 2002). A minimum of 4 (four) tests (loose samples) per Lot will be selected as follows:

A Lot will be divided into 4 (four) segments of approximately equal quantity. In each segment, a random tonnage sample will be determined by the Engineer. The Engineer will provide the Contractor with approximately two hours advance notice of loose sampling requirements, based on projected tonnage/production rates.

Each sample will be split into 2 (two) equal portions. One portion will be tested and the other will be set aside in the event that a re-test is required. The mean of the deviations for the Lot will be evaluated for acceptance and rejection requirements as indicated in Table 4.

6.2.4 Asphalt Density. Lots and trial mix areas will be divided into 5 (five) segments of approximately

equal quantity. Core samples will be taken from the roadway in locations designated by the Engineer. Coring locations for each Lot will be selected as follows:

The Engineer shall provide the Contractor with sample locations (station and offset) following placement of all asphalt concrete within a given Lot or trial mix area. Where traffic control conditions warrant, consideration shall be given to providing random core sample locations for a given mat (i.e. before all asphalt concrete for the Lot has been placed).

Cores shall not be taken within 0.15 m of the pavement edge or longitudinal joint, nor closer than 6 m to a transverse joint. Cores shall not be taken within 10 m of a loose sample location. Cores shall be obtained a minimum of 12 hours and a maximum 24 hours after the placement of the asphalt concrete. The Contractor shall have the option of using dry ice to obtain the cores earlier than 12 hours after placement.

The percent compaction for each core sample shall be determined using the individual core density and the average maximum theoretical density for the Lot. The sample mean of the Lot or trial mix density result will be evaluated for Acceptance and Rejection requirements as indicated in Table 4.

6.2.5 Thickness. The asphalt concrete shall be placed in lifts at the prescribed thickness as per the contract specifications and/or as directed by the Engineer. The pavement thickness shall be determined from the cores obtained in 6.2.4 Asphalt Density.

The maximum thickness for a Lot shall be determined on a segment by segment basis, corresponding to tonnage based coring segments. Individual thickness results will be evaluated for Acceptance and Rejection requirements as indicated in Table 4. If the maximum thickness does not meet the requirements of Table 4, the tonnage in excess of the calculated amount shall be subtracted from the lot tonnage as determined by weigh tickets.

6.2.6 Performance Graded Asphalt Binder (PGAB) Sampling. PGAB samples shall be obtained and packaged as follows:

One PGAB sample shall be obtained per 5000 t of asphalt concrete mix produced by the Contractor, on a random basis, as determined by the Engineer. The Engineer may opt to request one random sample per day. Samples shall be a minimum size of one litre and shall be taken from the Contractor's storage tank in accordance with ASTM D 140. Contractors shall ensure that their asphalt storage tank(s) are equipped with sampling spigots. The samples shall be labeled with the contract number, date, time, grade and type of PGAB, supplier, refinery, and the name and the proportions of any additives added to the PGAB.

It shall be the Engineer's responsibility to submit PGAB samples for quality assurance testing (to the Consultant under contract with TPW for Bituminous Testing) in accordance with the latest edition of the Standard Specification Division 4 Section 2.

6.2.7 Smoothness. The smoothness of the finished surface (top lift) of the pavement shall be measured by the Contractor, using a California Profilograph, in accordance with the latest edition of the Standard Specification - Appendix F, Smoothness Testing. Price adjustments for Profile Index (PRI) and Deviations will be as per Appendix F of the Standard Specification unless otherwise noted in the contract specifications.

6.2.8 Application Rate/Thickness and Cross Slope. The Contractor shall place the asphalt concrete in lifts at the thickness and cross slope indicated in the contract specifications or as otherwise directed by the Engineer.

Tonnage, thickness and cross slope shall be evaluated on a Lot by Lot basis. Tonnage shall govern the maximum amount of asphalt concrete placed. The total tonnage placed in a Lot shall not exceed the quantity determined by the following calculations:

(a) New Paving All Lifts (i.e. On Gravel Surface, Including Pulverization)

[1.10 x (application rate) x (theoretical length) x (theoretical width)] ÷ 1000

(b) Repaving (i.e. 1st Lift Over Existing Asphalt, Including Milled Surfaces):

[1.15 x (application rate) x (theoretical length) x (theoretical width)] ÷ 1000

(c) Repaving (i.e. 2nd Lift and Subsequent Lifts):

[1.10 x (application rate) x (theoretical length) x (theoretical width)] ÷ 1000

The quantity in excess of the calculated amount will be subtracted from the Lot tonnage determined by weigh tickets. Cross slope shall govern the minimum specified tolerance of the lines and grades for the asphalt concrete. The specified cross slope shall be maintained within ± 0.5% (± 15 mm when measured over 3 m, perpendicular to the centerline).

6.2.9 Reporting. The Engineer will provide the Contractor with a copy of the results of QA testing within 1 (one) working day of their availability. Acceptance test results for a given Lot will not be reported to the Contractor until the quality control results for that Lot have been reported to the Engineer. Tests performed by the Engineer will not be considered to be quality control tests. If the Lot results for any one

of the QA properties is outside the acceptance limits as listed in Table 4, the Lot will be evaluated in accordance with 6.4 Analysis of Rejected Lots.

Table 4
Acceptance and Rejection Requirements

Area	Payment			Repair/Replace Reject
	Full	Increased	Reduced	
%Theoretical Maximum Relative Density (Sample Mean)				
Lot	92.5	>92.5	89.0 - 92.4	<89.0
Asphalt Binder Content (%) (Mean of the Deviations of the Lot from the JMF)				
Type B-HF	0.0 - 0.40	N.A.	0.41 - 0.65	>0.65
Type C-HF	0.0 - 0.30	N.A.	0.31 - 0.50	>0.50
Type D-HF	0.0 - 0.30	N.A.	0.31 - 0.50	>0.50
Gradation (%) (Mean of the Deviations of the Lot from the JMF)				
Type B-HF (5 000)	0.00 - 6.00	N.A.	6.01 - 10.00	>10.00
(80)	0.00 - 0.80	N.A.	0.81 - 1.50	>1.50
Type C-HF (5 000)	0.00 - 5.00	N.A.	5.01 - 9.00	>9.00
(80)	0.00 - 0.50	N.A.	0.51 - 1.20	>1.20
Type D-HF (5 000)	0.00 - 5.00	N.A.	5.01 - 9.00	>9.00
(80)	0.00 - 0.50	N.A.	0.51 - 1.20	>1.20
In addition to the acceptance/rejection requirements for gradation, the following shall apply: a) The Lot will be rejected if the average of the lot test results for the 5 000 sieve size falls outside the gradation limits specified in Table 1. b) The Lot payment will be reduced by $5.00 per tonne, if the average of the Lot test results for the 80 sieve size exceeds, up to the maximum of 1.0%, the upper gradation limit specified in Table 1. c) The Lot will be rejected if the average of the Lot test results for the 80 sieve size exceeds, by more than 1.0%, the upper gradation limit specified in Table - 1.				
Thickness, % of the Number of Cores Taken Within Tolerance				
Lot	≥80.0%	N.A.	N.A.	<80.0%
New Paving All Lifts (i.e. On Gravel Surface, Including Pulverization): Minimum Lift Thickness Tolerance = 0.85 xspecified thickness Maximum Lift Thickness Tolerance = 1.15 xspecified thickness Repaving (i.e. 1st Lift Over Existing Asphalt, Including Milled Surfaces): Minimum Lift Thickness Tolerance = 0.80 xspecified thickness Maximum Lift Thickness Tolerance = 1.20 xspecified thickness Repaving (i.e. 2nd Lift and Subsequent Lifts): Minimum Lift Thickness Tolerance = 0.85 xspecified thickness Maximum Lift Thickness Tolerance = 1.15 xspecified thickness If the Thickness for the first lift of asphalt concrete is less than the tolerance, and a second lift of asphalt concrete is to be placed under the Contract, the Contractor shall place the second lift of the asphalt concrete to achieve a thickness equivalent to the total combined thickness required. The total first lift thickness shall be verified, for the deficient Lot, by the cores taken from the second lift of the identified deficient Lot.				

6.3 Appeals. The Contractor may appeal the results of QA testing for density, asphalt binder content, gradation and thickness for any rejected or penalized Lot. In the event of an appeal, the Contractor shall serve notice of appeal to the Engineer, in writing, within 48 hours of receipt of the QA test results.

The Contractor may have a representative present during appeal testing. During the period of the testing, the Contractor's representative shall comment on anything concerning the testing which he or she does not consider to be valid and the Engineer shall respond to all comments in order to resolve them.

Prior to leaving the testing laboratory any unresolved comments regarding the testing procedures are to be given to the Engineer in writing. Any comments, with respect to the testing procedures, which are made subsequent to the Contractor's representative leaving the laboratory will not be considered. The new Sample Mean or Mean of the Deviations, whichever the case may be, so obtained shall be binding on both the Contractor and the Department.

6.3.1 Appeal of Individual Test Results. The Contractor may appeal individual results of acceptance testing for the asphalt binder content and gradation properties only. When an individual test result from a Lot is challenged, the validity of the test result in question will be determined in accordance with ASTM E 178, Standard Practice for Dealing with Outlying Observations, using a "t" - test at a 5 (five) percent significance level. If the outlier test procedure shows that the challenged test result is valid, then it will be used in the calculations. If the outlier test procedure shows that the challenged test result is not valid, then the test result will be discarded unless there is an obvious error in the calculations or in transposing of the numbers. If there is no obvious error, the referee sample will be tested by the Engineer. Regardless of the presence of outlying observations in the re-tested sample and remaining original results, the results from the referee sample will be binding on both the Contractor and the Department and will be used in the calculations. The results from the outlier testing will be used for any subsequent referee challenges. The referee sample shall be tested for the following mix properties: asphalt binder content, gradation, maximum density, in the event that the results are needed for additional appeals, if required. A new Mean of the Deviations, for the combined test results, will be determined and this value will be used for acceptance and unit price adjustments.

6.3.2 Appeal of Test Results for the Entire Lot. The Contractor may appeal the entire Lot QA test results for the density, binder content, gradation and thickness properties for any rejected or penalized Lot only once. Appeal of test results for the entire Lot will only be considered if just cause can be shown by the Contractor that the acceptance test results are not representative of the product placed. If the Contractor's quality control test results indicate greater deviations from the JMF than the quality assurance test results, no appeal will be allowed.

6.3.2.1 Appeal of Lot Binder Content and Gradation. If the Lot asphalt binder content and/or gradation is appealed, the Engineer will submit the remaining portion of the samples obtained in 6.2.3 Asphalt Binder Content and Gradation for testing at the Department representative's laboratory.

6.3.2.2 Appeal of Lot Density. If the Lot density is appealed, the Contractor will take 5 (five) more cores at random locations as determined by the Engineer. The additional cores shall be taken within 48 hours (including Holidays and weekends) of the notice of appeal. Any attempt to improve density on the appealed Lot after the Engineer has tested the Lot for acceptance shall void the appeal and the original test results will apply. These cores shall be tested at the Department representative's laboratory. The high and low test results from the original Lot will be discarded and the remaining test results will be combined with the test results for the new samples.

6.3.2.3 Appeal of Lot Thickness. If the Lot thickness is appealed, the Contractor will take 7 (seven) more cores at random locations as determined by the Engineer. These cores shall be tested at the Department representative's laboratory. The high and low test results from the original Lot will be discarded and the remaining test results will be combined with the test results for the new samples. For thickness appeals, 8 (eight) of the 10 (ten) test results must meet or exceed the lift thickness tolerance specified in Table 4.

6.3.3 Payment of Appeal Testing Costs. If the new test results after the appeal process indicate that a penalty no longer applies, then the testing costs incurred by the Department during the appeal process for that Lot shall be borne by the Department. The Contractor shall be responsible for any other costs that they may incur.

If the new test results after the appeal process verify that a unit price adjustment or rejection remains valid for that Lot, the sampling and testing costs incurred by the Department during the appeal procedure shall be charged to the Contractor, as outlined in Table 6. The Contractor is responsible for any other costs that they may incur.

6.4 Analysis of Rejected Lots. Following an appeal of the entire Lot, in accordance with 6.3.2 Appeal of Test Results for the Entire Lot, if the new test results continue to indicate rejection, the new test results will be analyzed, at the discretion of the Engineer, to determine whether or not a portion of the Lot is acceptable. An analysis will be carried out to determine which segments may be acceptable. If the analysis indicates partial Lot acceptance, only those areas corresponding to the sample segment(s) in which rejected material placement occurred shall be subject to 6.5.1 Removal and Replacement. Any and all price adjustments corresponding to the recalculated test results (excluding those in the rejected segment(s)) shall apply.

6.5 Repairs. Rejected work shall be repaired, remedied, overlaid, or removed and replaced at the Contractor's expense. The asphalt concrete replacement or overlay shall be the same asphalt concrete mix designation as that which is removed or overlaid. All joints and the underlying asphalt concrete mat shall be tack-coated prior to repair.

The asphalt concrete used for replacement shall be the same asphalt concrete mix designation as that which is removed. Any rejected area will be subject to the repair options listed in Table 5.

The mix tonnage associated with the repair shall be produced in accordance with this specification. The repair tonnage shall be sampled in accordance with 1.1.5 Lot. Asphalt concrete comprising repaired areas shall be subject to testing in accordance with 6.0 Quality Control/Quality Assurance. Unit price adjustments calculated in accordance with Tables 7, 8, 9 and Tables 1 & 2 of the Smoothness Specification, Appendix F shall apply.

The cost of retesting shall be borne by the Contractor as listed in Table 6. All costs associated with repairs, removal and replacement, or overlays are the responsibility of the Contractor.

Table 5
Repair Requirements

Reason for Repair	Repair Option
Smoothness	Standard Specification, Appendix F
Thickness	Removal and Replacement, Overlaying
Surface defects Density Asphalt Binder Content Gradation	Removal and Replacement

6.5.1 Removal and Replacement. Rejected Lots or segments of Lots shall be removed by cold milling the full width of the lane and full depth of the lift in which the work is being performed.

Material removed shall become the property of the Contractor, to haul and stockpile or otherwise dispose of in an environmentally acceptable manner, at the Contractor's expense.

6.5.2 Overlaying. Overlaying as a method of repair will be only be considered in areas designated by the Engineer, for Lots or segments of Lots which are subject to rejection based on thickness or smoothness. The asphalt concrete mix used to construct the overlay shall meet the same requirements as the pavement which is overlaid. The overlay shall extend the full width of the underlying pavement surface and have a finished compacted thickness of not less than 50 mm for B-HF and 40 mm for C-HF and 35 mm for D-HF.

A keyed joint shall be constructed at each end of the overlaid section as per 5.5.3 Keyed Joints. If an acceptable grade and cross slope cannot be achieved, the Contractor shall repair the area in accordance with 6.5.1 Removal and Replacement. If an overlay results in the need for additional shouldering material or adjustments to guide posts and guardrail, this work shall be carried out, at the Contractor's expense, in accordance with the applicable items as per the Standard Specification.

7.0 METHOD OF MEASUREMENT

The quantity of asphalt concrete to be measured for payment shall be the number of tonnes of mix placed and accepted in accordance with this specification. The quantity of PGAB will not be measured separately. Unit price adjustments calculated in accordance with Tables 7, 8, 9 and Tables 1 & 2 of the Smoothness Specification, Appendix F shall apply.

8.0 BASIS OF PAYMENT

8.1 Asphalt Concrete. Asphalt concrete will be paid for at the contract unit price per tonne for mix incorporated and accepted in the work, which price shall be full compensation for furnishing of all aggregates, natural sand, PGAB, heating, handling, transporting, mixing, placing and compacting the mix, the supply of all equipment, plant, labour, traffic control and incidentals necessary to complete the work.

PGAB is not paid as a separate item, however, unit price adjustments associated with the asphalt binder material (temperature deviations) shall apply as per Division 4, Section 2 Performance Graded Asphalt Binder.

Price adjustments determined in accordance with this specification will be calculated on a Lot by Lot basis and issued on the final progress estimate.

8.1.1 Payment for Rejected Mix. The Department will pay for only the original mix quantity. The Contractor is fully responsible to bear all costs associated with repair of rejected areas, including all materials, equipment, plant, labour, traffic control and incidentals necessary to complete the work to the satisfaction of Engineer.

Table 6
Charges For Retesting

Activity	Price
Profilograph	Standard TPW Inspection Agreement Rates
Lab Tests	Standard TPW Inspection Agreement Rates

Table 7
Unit Price Adjustment for Density

% of Maximum Theoretical Density (Lot Average)	Unit Price Adjustment ($ per Tonne)	% of Maximum Theoretical Density (Lot Average)	Unit Price Adjustment ($ per Tonne)
≥93.0	+0.50	90.9	-2.40
92.9	+0.40	90.8	-2.80
92.8	+0.30	90.7	-3.20
92.7	+0.20	90.6	-3.6
92.6	+0.10	90.5	-4.00
92.5	0	90.4	-4.40
92.4	-0.1	90.3	-4.80
92.3	-0.2	90.2	-5.20
92.2	-0.3	90.1	-5.60
92.1	-0.4	90	-6.00
92	-0.5	89.9	-7.00
91.9	-0.6	89.8	-8.00
91.8	-0.7	89.7	-9.00
91.7	-0.8	89.6	-10.00
91.6	-0.9	89.5	-11.00
91.5	-1	89.4	-12.00
91.4	-1.2	89.3	-13.00
91.3	-1.4	89.2	-14.00
91.2	-1.6	89.1	-15.00
91.1	-1.8	89	-16.00
91.0	-2	<89.0	reject

Table 8
B-HF Unit Price Adjustment For Asphalt Binder Content

Mean of the Deviations of Actual Asphalt Binder Content from the JMF		Unit Price Adjustment For Asphalt Binder Content $ per Tonne
B-HF	0.00 to 0.40	0.00
	0.41 to 0.45	-1.00
	0.46 to 0.50	-2.00
	0.51 to 0.55	-3.00
	0.56 to 0.60	-4.00
	0.61 to 0.65	-5.00
	>0.65	reject

C-HF Unit Price Adjustment For Asphalt Binder Content

Mean of the Deviations of Actual Asphalt Binder Content from the JMF		Unit Price Adjustment For Asphalt Binder Content $ per Tonne
C-HF	0.00 to 0.30	0.00
	0.31 to 0.35	-1.00
	0.36 to 0.41	-2.00
	0.41 to 0.45	-3.00
	0.46 to 0.50	-4.00
	>0.50	reject

D-HF Unit Price Adjustment For Asphalt Binder Content

Mean of the Deviations of Actual Asphalt Binder Content from the JMF		Unit Price Adjustment For Asphalt Binder Content $ per Tonne
D-HF	0.00 to 0.30	0.00
	0.31 to 0.35	-1.00
	0.36 to 0.41	-2.00
	0.41 to 0.45	-3.00
	0.46 to 0.50	-4.00
	>0.50	reject

Table 9
Unit Price Adjustment For Gradation

Sieve Designation	Mean of the Deviations of the Gradation from the JMF			Unit Price Adjustment for Gradation
	B-HF	C-HF	D-HF	$ per Tonne
5 000	0.00 to 6.00	0.00 to 5.00	0.00 to 5.00	0.00
	6.01 to 6.20	5.01 to 5.20	5.01 to 5.20	-0.50
	6.21 to 6.40	5.21 to 5.40	5.21 to 5.40	-1.00
	6.41 to 6.60	5.41 to 5.60	5.41 to 5.60	-1.50
	6.61 to 6.80	5.61 to 5.80	5.61 to 5.80	-2.00
	6.81 to 7.00	5.81 to 6.00	5.81 to 6.00	-2.50
	7.01 to 7.20	6.01 to 6.20	6.01 to 6.20	-3.00
	7.21 to 7.40	6.21 to 6.40	6.21 to 6.40	-3.50
	7.41 to 7.60	6.41 to 6.60	6.41 to 6.60	-4.00
	7.61 to 7.80	6.61 to 6.80	6.61 to 6.80	-4.50
	7.81 to 8.00	6.81 to 7.00	6.81 to 7.00	-5.00
	8.01 to 9.00	7.01 to 8.00	7.01 to 8.00	-10.00
	9.01 to 10.00	8.01 to 9.00	8.01 to 9.00	-15.00
	>10.00	>9.00	>9.00	reject
80	0.0 to 0.80	0.0 to 0.50	0.0 to 0.50	0.00
	0.81 to 0.90	0.51 to 0.60	0.51 to 0.60	-1.00
	0.91 to 1.00	0.61 to 0.70	0.61 to 0.70	-2.00
	1.01 to 1.10	0.71 to 0.80	0.71 to 0.80	-3.00
	1.11 to 1.20	0.81 to 0.90	0.81 to 0.90	-5.00
	1.21 to 1.30	0.91 to 1.00	0.91 to 1.00	-7.50
	1.31 to 1.50	1.01 to 1.20	1.01 to 1.20	-12.00
	>1.50	>1.20	>1.20	reject

In addition to the acceptance/rejection requirements for gradation, the following shall apply:

a) The Lot will be rejected if the average of the Lot test results for the 5 000 sieve size falls outside the gradation limits specified in Table 1.

b) The Lot payment will be reduced by $5.00 per tonne if the average of the Lot test results for the 80 sieve size exceeds, up to the maximum of 1.0%, the upper gradation limit specified in Table 1.

c) The Lot will be rejected if the average of the Lot test results for the 80 sieve size exceeds, by more than 1.0%, the upper gradation limit specified in Table 1.

SECTION 7 - CAST IN PLACE CONCRETE

1.0 DESCRIPTION

This section details the requirements for materials and methods in the proportioning, mixing, transport, placement, finishing and inspection of cast in place Portland Cement Concrete (PCC).

2.0 REFERENCES

All reference standards shall be current issue or latest revision at the first date of tender advertisement. This specification refers to the following standards, specifications or publications:

- ANSI/ACI 117, Tolerances for Concrete Construction and Materials
- ASTM C 260, Air-Entraining Admixtures for Concrete
- ASTM C 309, Specification for Liquid Membrane-Forming Compounds for Curing Concrete
- ASTM C 494, Chemical Admixtures for Concrete
- ASTM C 1064, Temperature of Freshly Mixed Portland Cement Concrete
- ASTM D 1751, Preformed Expansion Joint Filler for Concrete Paving and Structural Construction
- CGSB 37.2-M, Emulsified Asphalt Mineral Colloid Type Unfilled for Damp-Proofing, Water-Proofing and for Roof Coatings
- CGSB 37.3-M, Application of Emulsified Asphalts for Damp-Proofing or Water-Proofing
- CSA A5, Portland Cement
- CSA A23.1, Concrete Materials and Methods of Concrete Construction
- CSA A23.2, Methods of Test for Concrete
- CSA A23.5, Supplementary Cementing Materials
- CSA A362, Blended Hydraulic Cement
- CSA S269.3, Concrete Formwork
- Drawing HS504.DWG
- Drawing HS505.DWG
- Drawing HS506.DWG
- Drawing HS529.DWG

3.0 SUBMISSIONS AND DESIGN REQUIREMENTS

3.1 Formwork and Falsework. One copy of drawings and design calculations for Formwork and related Work bearing a Registered Professional Engineer's seal shall be submitted by the Contractor to the Engineer for review at least four (4) weeks before construction. The submission is intended for information purposes only and shall in no way relieve the Contractor of full responsibility to carry out work related in accordance with CSA S269.3 for Concrete Formwork and CSA S269.1 for Falsework.

3.2 Notification of Ready Mix Supplier. At least two weeks in advance, the Contractor shall advise the Engineer of the qualified Ready Mixed Concrete Supplier which they propose to use. The Engineer will verify the acceptability of the Supplier and the mixture designs. Acceptance of the Supplier and the mixture designs by the Engineer does not relieve or reduce the responsibility of the Contractor or Supplier from the requirements of the specification.

3.3 Advance Qualification of Ready Mixed Concrete Suppliers. The Contractor shall recognize that the Department may qualify in advance, as detailed below, Ready Mixed Concrete Suppliers, however, the Department bears no responsibility for said advance qualification. Liability for the product supplied shall be the sole responsibility of the Contractor.

Ready Mixed Concrete Suppliers may become qualified prior to supplying concrete to Department projects. Qualification may be obtained by submitting current relevant acceptance test data and concrete mixture designs, typically specified for Cast in Place Concrete, to the Department for review prior to the first day of December. Current relevant acceptance test data is defined as data which has been obtained within ninety days prior to the first day of December. The Department will maintain a list of qualified Ready Mixed Concrete Suppliers including their concrete mixture designs. Ready Mix Concrete Suppliers who become qualified in the month of December, shall remain qualified to the thirty first day of December of the following year.

3.3.1 Required Test Information. The Ready Mixed Concrete Supplier shall provide relevant test data for all materials indicating conformance to the requirements of CSA-A23.1 and this specification. The sources and test results of all materials shall be clearly identified. The aggregate tests shall be conducted by a testing laboratory, approved by the Department, under the direction of a Professional Engineer registered to practice in Nova Scotia. Test data required shall include, but not be limited to:

- portland cement
- blended hydraulic cement (if used)
- supplementary cementing materials
- admixtures
- water
- aggregates

Aggregate testing shall consist of:

- Sieve Analysis[1] of Fine and Coarse aggregate
- Amount of Material Finer[1] Than 80 µm in Aggregate
- Bulk Relative Density and Absorption of Fine and Coarse Aggregate (SSD basis)
- Fineness Modulus[1] of Fine Aggregate
- Clay Lumps and Light Weight Pieces

- Test for Organic Impurities in Fine Aggregate
- Flat and Elongated Particles in Coarse Aggregates
- Petrographic Analysis of Coarse Aggregate (PN - NS Test Method)
- Resistance to Degradation of Coarse Aggregate by Abrasion and Impact in the Los Angeles machine
- Micro-Deval test for Fine Aggregates
- Soundness of Coarse & Fine Aggregate by Use of Magnesium Sulphate
- Test for Detection of Alkali-Aggregate Reactivity [2] (AAR) on Coarse Aggregate (every 2 years).

[1]Prior to the first concrete placement, a washed sieve analysis shall be conducted on each proposed stockpiled aggregate at the ready mix plant, representative of the materials to be used in the work and the results submitted to the Engineer by the Contractor.

[2] If the aggregate is known to be reactive AAR testing must be conducted utilizing a supplementary cementing material to mitigate the reaction.

3.3.2 Certification and Membership. The Ready Mixed Concrete Supplier shall provide current plant certification and membership certificates issued by the Atlantic Provinces Ready Mixed Concrete Association (APRMCA).

3.4 Ready Mix Concrete Suppliers (Not Qualified in Advance). In the event that the Contractor selects a Ready Mixed Concrete Supplier not qualified in advance by the Department, the Contractor shall, within 4 weeks prior to starting concrete work, submit to the Engineer all of the required information detailed in Subsection 3.3 of this section. The Engineer will verify the acceptability of the Supplier and the mixture designs. Ready Mix Concrete Suppliers who become qualified after January first, shall remain qualified to the thirty first day of December in the same calendar year.

4.0 MATERIALS

4.1 General. All materials used in the production of concrete shall conform to the referenced standards.

4.2 Formwork. Formwork shall be constructed from lumber devoid of warp and defects in order to achieve a face alignment free from distortion. This shall apply to all panel forms including prefabricated boards, plywood and steel panels. Prior to assembly and placement of reinforcing steel all forms and panels shall be treated with a non-staining, non-reactive mineral oil or liquid, as approved by the Engineer. Patching shall be kept to a minimum.

Formwork shall be supported by shores to sustain all horizontal and vertical loads during placing of the PCC.

Column forms shall be seamless heavy gauge galvanized steel and/or fibre column molds.

4.3 Concrete Mixture Designs

4.3.1 Proportioning. Concrete mixtures shall be proportioned in accordance with CSA A23.1, Alternative #1, and the Contractor shall accept responsibility for concrete strength. The physical properties for various structural elements are identified in Table 5.7.1 of this specification. Fly ash and/or silica fume may be used, however, the Department reserves the right to limit their proportion to 20% and 10% respectively in the mix.

4.3.2 Mix Proportions. The Ready Mixed Concrete Supplier shall select mix proportions that shall produce concrete of specified quality, yield and strength complying with Alternative #1 CSA-A23.1, and Table 5.7.1 of this specification. Typical mixture designs include, but are not limited to:

- 20 mm 25 MPa
- 20 mm 30 MPa
- 20 mm 32 MPa
- 20 mm 35 MPa

A report outlining the proposed mixture designs shall be signed by a Professional Engineer registered to practice in Nova Scotia. The Professional Engineer shall attest to the validity of the material test data stated in Subsection 3.3. Mix designs incorporating alkali reactive aggregate shall be adjusted to limit excessive expansions.

4.3.3 Changes to Mixture Designs or Material Properties. If material characteristics change after the Ready Mixed Concrete Supplier becomes qualified, the Contractor shall provide physical properties and certified test results as indicated in Subsection 3.3 of this specification. In the event mixture designs are modified without changing material characteristics, the revised mixture designs shall be submitted to the Engineer.

4.3.4 Concrete Mix Specifications. The mix design specifications can be found in Table 5.7.1

Table 5.7.1 - Concrete Mixture Design Specifications

Element	Footing	Leveling Slab	Tremie	Roadway Curbs & Sidewalks, Jersey Barrier, Driveway Entrances, Abutment, Wingwall, Slope Protection, Culvert, Road Drain, Sign Base	Bridge Deck Sidewalk, Curb, Parapets, End Posts, Backwall, Beam Seat, Column, Pier Cap
Maximum Nominal Aggregate, mm	40	20[1]	20	20	20
Minimum 28 Day Compressive Strength, MPa	30		30	32	35
Maximum Water/cementing Material Ratio	0.50		0.45	0.45	0.40
Minimum Cementitious Content kg/m³[2]	300		390	350	415
Air Content %	6 ± 1		6 ± 1	6 ± 1	6 ± 1
Slump, mm	80 ± 20		170 ± 30	80 ± 20[4]	80 ± 20
Required Admixtures[3]	Water Reducer, Air Entrainment				

[1] Either aggregate size may be utilized unless otherwise specified.
[2] Portland Cement shall be Type 10 Normal unless otherwise specified.
[3] Other admixtures such as Retarders, Accelerators or Superplasticizers may be used if approved by the Engineer.
[4] Lower slump may be required when a slip form machine is used to place concrete.

4.4 Aggregate Specification. The maximum Petrographic Number of coarse aggregate shall not exceed 140. The maximum absorption of coarse aggregate shall not exceed 2%.

4.5 Curing Compounds. Membrane curing compound shall be white pigmented Type 2, meeting the requirements of ASTM C309.

4.6 Damp-Proofing. All damp-proofing material shall conform to CAN/CGSB-37.2-M and shall be applied in accordance with CGSB-37.3.

5.0 CONSTRUCTION METHODS

5.1 Formwork Design. Formwork design and the proposed method of construction shall meet all necessary requirements in terms of strength and properties of material, rigidity and erection tolerances as presented in Subsection 5.1 of this specification.

Formwork shall be built with sufficient strength and rigidity to carry the mass or fluid pressure of the PCC as well as all construction loads including wind, equipment and runways which might be placed upon them. The fluid pressure on forms shall be correlated to the capacity and type of placing equipment, the rate of placing, slump and temperature of the PCC.

Formwork shall be supported by stiff members in two directions at right angles which are sufficiently rigid to hold the unit as a whole in line and in proper position and shape. Formwork shall be accurately located, rigidly tied or braced to resist vertical or horizontal movements and adequately supported. However, they shall be so arranged to allow for easy stripping to prevent damage of the PCC during removal. The use of twisted wires and wood spreaders are prohibited unless approved by the Engineer.

5.1.1 Formwork/Falsework Construction. The Contractor shall construct the falsework and formwork in accordance with the approved drawings. Variations from the drawings shall not be permitted unless such variations are approved by the Designer, and the Engineer is provided with revised drawings prior to construction. Both the falsework and formwork shall be designed and constructed to provide the necessary rigidity and to support the loads without settlement or excessive deflection.

All falsework and formwork used to support fresh concrete during construction of the following components shall be designed by a Registered

Professional Engineer in accordance with CSA S269.3:
- bridge decks and pier caps
- columns over 3 m in height
- retaining walls over 3 m in height
- roofs of structures under which persons are required to work
- as required on the contract drawings

5.1.2 Construction Joints. The locations and details of vertical construction joints not indicated on the drawings shall be submitted by the Contractor to the Engineer for his approval. PCC in piers and abutments shall be placed without horizonal construction joints unless previously approved by the Engineer.

5.1.3 Removal/Re-Use of Formwork and Falsework. Formwork and falsework shall not be removed without the approval of the Engineer.

All formwork and falsework shall be completely removed from the structure. Formwork shall be removed progressively and with care so that corners of PCC members are not damaged or marred.

The time of removal of the falsework shall be determined by the strength and curing requirements of the concrete and the ability of the structure to carry its own dead load and any live or construction load that may be placed on it. Where field operations are controlled by beam or cylinder tests, the formwork and falsework may be removed when the PCC has reached the required strength as determined by the Engineer

Formwork material intended for re-use shall be clean and in satisfactory condition. Formwork shall not be re-used without the Engineer's approval.

5.1.4 Formwork Tolerances. The following tolerances in Table 5.7.2 are permitted for lines, grades or dimensions shown on the contract drawings:

5.2 Concrete Production. Concrete shall be produced at a stationary or portable plant. Concrete shall not be supplied to any Department project unless the Ready Mixed Concrete Supplier is qualified by the Department and so designated.

5.2.1 Mixing and Transporting. The concrete materials shall be mixed and transported in a manner which will not segregate or damage the mix in any fashion. Concrete shall be mixed utilizing stationary or truck mixers. The mixer shall carry the Manufacturer's rating plate in a prominent position, indicating:
- the gross volume of the mixer
- the rated maximum mixing capacity
- the minimum and maximum speeds for mixing and agitating of the mixer

Table 5.7.2 - Formwork Tolerance

Variation From Contract Drawings	Tolerance
(I) For plumb or specified batter at columns, piers and walls	12 mm in 3 m for Exposed area 25 mm in 3 m for Backfilled area
(II) For level or specified grade in slabs, beams, horizontal groves, railing offset, etc.	12 mm in 3 m for Exposed area 25 mm in 3 m for Backfilled area
(III) X-Sectional dimensions for Piers, Columns, Beams, slabs, walls, etc.	No more than 12 mm No less than 6 mm
(IV) Bridge Deck Thickness	No more than 6 mm No less than 3 mm
(V) Footing Length & Width	No more than 50 mm No less than 12 mm
(VI) Footing thickness	minus 5% of the specified thickness

All mixers shall be capable of combining the concrete ingredients into a thoroughly mixed and uniform mass. In no case shall the mixer loading exceed its rated maximum mixing capacity.

Mixers shall be emptied before charging. The mixer shall be rotated at the Manufacturer's recommended mixing speed during charging and mixing.

Where ready mix trucks are used to transport the concrete, the Department reserves the right to subject any truck suspected of poor mixing to a uniformity test as outlined in CSA A23. If said truck fails the uniformity test, then the concrete and the truck shall be rejected unless otherwise directed by the Engineer. The truck shall not be permitted on a Department site until appropriate repairs have been completed and certified.

5.3 Form Preparation/Concrete Placement. The Contractor shall provide the Engineer with at least 24 hours notice of intent to place concrete in order to permit the Engineer to schedule inspection services. All PCC placing methods shall be subject to the approval of the Engineer.

In preparation for the placing of concrete, all sawdust, chips, construction debris and other deleterious materials shall be removed from the interior of forms.

The PCC shall be delivered to the point of final deposit in a manner satisfactory to the Engineer using means and equipment which will prevent segregation or loss of materials. The size of section to be placed in one continuous operation shall be as detailed on the drawings or as directed by the Engineer. PCC for deck slabs shall not be placed between November 15 and April 15, without the written approval of the Engineer.

Unless otherwise authorized by the Engineer, forms shall be kept dry during the placing of the PCC until the PCC has reached initial set. The Contractor shall be held responsible for the placing method used. PCC shall be deposited in the forms in maximum lifts of 500 mm and in layers that are approximately horizontal and as close as practicable to its final position. PCC shall not be moved horizontally with vibrators or by other methods which could cause segregation.

The conveying equipment shall be kept free from deleterious materials and cleaned at frequent intervals. Conveying equipment, if supported by formwork, shall not impart harmful vibration to PCC nor cause misalignment of forms.

Under adverse weather conditions the Contractor shall be prepared to provide suitable protection in order to prevent damage to PCC.

Unless otherwise authorized by the Engineer, wood spreaders shall not be used in any PCC where either face will be exposed or in any wall where water tightness is required.

If the PCC details are such that a feather edge or thin section might be created by the sequence of casting, a bulkhead should be introduced to maintain an edge thickness of at least 100 mm.

5.3.1 Placing Concrete Under Water (Tremie Method). Notwithstanding the provisions elsewhere stated in this specification, the following provisions shall apply to PCC deposited under water. PCC shall be deposited under water only when specifically authorized by the Engineer. The methods, equipment, materials, forms and cofferdams shall be approved by the Engineer before work is started, but such approval shall not in any way relieve the Contractor of liability in connection with the work.

Tremie Concrete shall comply with the provisions of CSA A23.1. The placing of PCC under water shall be carried on continuously until that portion of the structure is completed.

At the start of the concreting operation, the tremie pipe shall be sealed at the bottom with a plug or foot valve to prevent ingress of water.

All laitance, slime or other matter deposited or formed on the surface of any PCC under water shall be removed before any additional PCC is placed on same.

5.3.2 Placing and Finishing Bridge Deck Concrete. The finished surface of the deck concrete shall conform to grades and elevations shown on the contract drawings. Prior to placing deck concrete, the Contractor shall submit to the Engineer detailed information on the method and equipment proposed for handling, placing and finishing of the concrete. The Contractor shall also demonstrate to the satisfaction of the Engineer that all necessary adjustments have been made to provide the required camber, crown, slab thickness and concrete cover over reinforcement, prior to placement.

The surface shall be finished with a mechanical screed machine, which shall be supported by guide rails and span the full width of the deck. Guide rails shall be located outside the finished surface of the deck. Supports for the guide rails shall be capable of fine adjustment and not be fixed to, or located upon, the reinforcing steel. The quantity of supports shall be such that the screed rails do not deflect more than 1 mm during the screeding operation.

Immediately prior to placement of deck concrete, the formwork shall be cleaned and thoroughly moistened. The Contractor shall also moisten the reinforcing steel with water at the request of the Engineer. Deck concrete shall be placed continuously between transverse joints until completion of the section. The placing sequence for continuous structures shall conform with the contract drawings.

The concrete surface shall be floated with a wooden or magnesium float.

The concrete shall be textured by means of a burlap drag, broom or approved alternative.
There shall be no application of water or cement to the concrete surface for finishing purposes.

Deck concrete shall be water cured as indicated in Subsection 5.5.4 of this specification. During freezing temperatures, water curing shall be terminated 12 hours prior to the end of the protection period.

5.3.3 Roadway Concrete Curb/Gutter, Sidewalk, Jersey Barrier, Culvert Slabs and Haunches. Concrete curb/gutter shall be constructed in accordance with this specification and with drawings HS504 and HS505 or as noted in the Special Provision of the contract. Jersey Barrier shall be constructed in accordance with this specification and with drawing

HS529 or as noted in the Special Provisions of the contract. Culvert slabs and haunches shall be constructed in accordance with this specification and with drawing HS506 or as noted in the Special Provisions of the contract. Roadway Curb/Gutter, Sidewalk and Jersey Barrier shall be constructed with wood or metal forms or by a slip form paver.

At driveways, concrete curb Type A shall be depressed 100 mm at the road edge and 80 mm at the back. Types B, C and D shall be depressed 120 mm at the road edge and 100 mm at the back. Unless otherwise specified, driveway widths as measured along the depression shall be 3.7 m for a single driveway and 5.0 m for a double driveway.

Catch basin metal frames and grates shall be adjusted to grade prior to placement of adjacent curb and gutter.

Control joints shall be formed by saw cutting or by use of a jointing tool. Control joints shall be constructed at right angles to the edge of the Curb/Gutter, Sidewalk and Jersey Barrier. Saw cuts shall be made between one quarter to one third of the depth of the section and extend along the entire exposed face. Concrete shall be saw cut as soon as possible after finishing without causing excessive raveling and before shrinkage cracks occur. Saw cutting shall be completed within 24 hours of the concrete achieving final set. Sidewalks shall be 1.5 m wide and 100 mm thick except at driveway entrances where the thickness shall be 150 mm. The maximum spacing of control joints for curb/gutter and Jersey Barrier shall be 5.0 m. The maximum spacing of control joints for sidewalk shall be 1.5 m. Control joints shall also be placed at a distance of 1.5 m from the centre of catch basins.

If an isolation jointing material is used, it shall be a pre-molded non-extruding bituminous impregnated fibre-board, 12 mm thick, conforming to ASTM D 1751. The jointing material shall extend the full width and depth of the section and shall be flush with the surface.

Curb/Gutter, Sidewalk and Jersey Barrier shall be cured as indicated in Subsection 5.5 of this specification.

The Contractor shall backfill the area behind the curb to a distance not exceeding 0.6 m from the back of the curb. The material used shall be of a common or borrow type free from large rock or organic material. Granular materials shall not be used.

5.4 Consolidation. All methods of consolidation shall be subject to the approval of the Engineer. PCC shall be consolidated thoroughly and uniformly by means of hand tamping, vibrators or finishing machines to obtain a dense, homogeneous structure, free from cold joints, voids and honeycomb.

A sufficient number of vibrators shall be employed to adequately handle the anticipated rate of placement. The size and frequency of vibrators shall be as specified in CSA A23.1. A stand-by vibrator shall be available on the site at all times.

Internal vibrators shall be used wherever practicable. External type vibrators may be used where surfaces cannot be properly consolidated with the internal type alone.

Insertion of internal vibrators shall be made systematically at intervals such that the zones of influence of the vibrator overlap.

Extreme care shall be taken to ensure that the internal type vibrators do not displace the reinforcing steel or the forms. Vibrators shall have rubber or non-metallic vibrating heads if epoxy coated reinforcing steel is used.

5.5 Curing Concrete. PCC shall be protected from freezing, premature drying, high temperature and moisture loss for a period of time necessary to develop the desired properties of the concrete. Curing shall be applied to PCC as soon as possible without damaging or marring the surface. The curing time shall be as indicated in CSA A23.1 or this specification. Curing shall be achieved by one or more of the following:

5.5.1 Burlap. Two layers of pre-soaked burlap shall be carefully laid on the surface as soon as the PCC has set sufficiently to support the mass of the burlap without marking the surface. Strips shall be overlapped 150 mm, secured to the surface and kept wet throughout the curing period.

5.5.2 Moisture Vapour Barrier. The Contractor shall provide an effective vapour barrier and prevent any flow of air between it and the PCC surface. Where polyethylene sheet is used, it shall be white opaque pigmented with a minimum thickness of 100 µm. The vapour barrier shall be secured to the surface and overlapped 150 mm.

5.5.3 White Pigment Liquid Membrane. Curing compounds shall not be used on a surface where a bond is required for additional PCC. A curing compound may be approved by the Engineer under certain circumstances where the application of moisture is impracticable and where such compounds will not jeopardize the appearance of the PCC. Curing compounds shall be applied at the Manufacturer's recommended application rate. Curing compounds are not permitted on construction joints, surfaces requiring weatherproofing sealants or deck sections.

5.5.4 Water. All PCC bridge decks shall be cured with

water unless otherwise directed by the Engineer. PCC exposed surfaces shall be kept continuously moist for a minimum of seven consecutive days after placing when Type 10 or Type 50 cements are used. If Type 30 cement is used, the surfaces shall be kept wet for a minimum of three consecutive days after placement. The water for curing shall be clean and free from any material which could cause staining or discoloration of the PCC.

All freshly placed and consolidated PCC shall be suitably protected from the elements and from defacement due to building operations, traffic and vandals. The effects of direct sunshine, drying winds, cold, excessive heat and running water are particularly harmful. The PCC shall be protected by the use of adequate tarpaulins or other suitable material to completely cover, or enclose, all freshly finished surfaces.

5.6 Hot Weather Concreting. When the air temperature is at or above 27°C, or is likely to rise above 27°C within 24 hours, special measures, as detailed in CSA A23.1, shall be taken by the Contractor to protect the concrete from the effects of hot and/or drying weather conditions. The temperature of the formwork, reinforcing steel or the material on which the concrete is to be placed, shall not exceed 27°C.

Concrete temperatures shall not exceed those specified in CSA A23.1, Table 16.

5.7 Cold Weather Concreting. When the mean air temperature is at or below 5°C or when the temperature is likely to fall below 5°C within 24 hours, the Contractor shall place, cure and protect PCC in accordance with CSA 23.1 and this specification.

PCC shall not be placed on or against any surface which is at a temperature less than 5°C. Snow and ice shall be removed before PCC is deposited on any surface. Calcium chloride or other de-icing chemicals shall not be used as a deicing agent in the forms.

If the Department specifies heating of the mix water and/or aggregates, the charging cycle shall be altered to prevent flash setting of the PCC. Aggregates and water shall not be heated above 80°C. Water and/or aggregates heated to a temperature in excess of 40°C, shall be batched in the mixer first to reduce the temperature of the combination below 40°C, prior to the addition of the cementing materials . All frozen lumps of aggregate shall be excluded from the mix.

5.8 Protection Classes. Protection and curing depends upon the outside temperature, the wind velocity, and the size of the PCC section. Under normal circumstances the following methods of protection may be required to maintain the protection necessary for the conditions described.

Heating of the mixing water and/or aggregates shall be required for all classes of protection.

5.8.1 Special Protection. When the outside temperature during placing or during the protection period may fall below 5°C, adequate covering of all surfaces with tarpaulins or polyethylene sheets shall be provided.

5.8.2 Special Protection with Insulation. When the outside temperature during placing or during the protection period may fall below 0°C, all surfaces shall be covered with an approved insulating material, over which tarpaulins or polyethylene sheets are placed.

5.8.3 Complete Housing with Heat. When the outside temperature during placing or during the protection period may fall below -5°C, a complete housing of the PCC, together with supplementary heat, shall be provided. The Contractor shall ensure that heat is supplied uniformly around the PCC. For mass concrete, defined as minimum section dimension in excess of 2 m, the temperature gradient shall not exceed 20°C/m from the interior of the element to the exterior face. In thin sections, less than 2 m, the temperature differential from the interior to the exterior shall not exceed 20°C. Steam or hot air blowers may be used, but a means of maintaining relative humidity of not less than 95% shall be provided. When dry heat is used, hot air shall not be permitted to flow directly onto the PCC surface. Exhaust fumes shall be vented.

The protection and curing shall continue to maintain the temperature of the PCC at not less than 10°C for five days after placing. The PCC shall be kept above 0°C for a total period of fourteen days. If Type 30 cement is used, the protection period may be reduced to 70% of the stated times.

At the end of the curing and protection period, protection and heating shall be withdrawn in such a manner as not to induce thermal shock stresses in the PCC. The temperature of the concrete shall be gradually reduced to avoid cracking due to sudden temperature changes near the end of the curing period. The protection shall not be completely removed until the concrete has cooled to the temperature differential stated in Table 18 of CSA A23.1.

5.9 Concrete Surface Finish

5.9.1 Formed Surface. All formed surfaces shall receive the basic treatment as indicated below. In

addition to the basic treatment, all exposed surfaces shall receive a "Smooth Form" finish as indicated below.

5.9.1.1 Basic Treatment. Upon removal of the forms, all cavities, honeycomb, and other deficiencies shall be patched with a sand cement mortar of the same composition as that used in the PCC. Mortar shall be composed of cement, fine aggregate and water, proportioned and mixed as specified. When the proportioning of cement and fine aggregate is not specified, the mortar shall consist of one (1) part by volume of cement and two (2) parts of fine aggregate. The quantity of water used in mixing the mortar shall be sufficient to make it capable of being freely spread with the trowel. Mortar shall be mixed in quantities which can be utilized within 60 minutes. Mortar shall not be re-tempered or remixed with water after initial set.

All bolts, ties, nails, or other metal not specifically required for construction purposes, shall be removed or cut back to a depth of 25 mm from the surface of the PCC unless otherwise directed by the Engineer. The cavity shall be keep saturated for 60 minutes prior to the application of a latex bonding agent or neat cement paste. The mortar shall be pressed or packed into the depressions so as to completely fill the cavity and then finished to match the adjacent surface. Fins, unsightly ridges, or other imperfections shall be chipped or rubbed off flush with the surface. Mortar patches in excess of 25 mm shall be applied in layers not exceeding 25 mm with a 30 minute interval between the placing of layers. The surface of the patch shall be textured equivalent to the adjacent concrete.

Honeycomb areas or cavities over 25 mm in diameter shall not be repaired until inspected by the Engineer. Where honeycombing has occurred in non-structural elements, the affected area shall be removed and filled with mortar as previously described. Where honeycombing has occurred in structural elements, the corrective method of treatment shall be carried out as directed by the Engineer.

All concrete and mortar shall be cured and protected in accordance with CSA A23.1 and Subsection 5.5 of this specification.

5.9.1.2 Smooth Form Finish. A Smooth Form Finish shall be a uniform, high quality concrete which has been homogeneously placed and thoroughly compacted. A Smooth Form Finish shall be uniform in colour, pattern and texture. Curbs, sidewalks, parapet walls, abutments, piers and any other surfaces the Engineer may designate, shall have a Smooth Form Finish.

If the concrete, after form stripping and the basic treatment, does not exhibit such finish, the Contractor shall perform any or all of the following operations, as directed by the Engineer, in order to obtain a Smooth Form Finish:

- cut out all corrodible metal within 25 mm of the surface and repair the cavities as indicated in Subsection 5.9.1.1, basic treatment.
- remove fins and other projections to leave a smooth, plane surface.
- remove stains, rust marks or other blemishes which detract from the specified uniformity of appearance.

5.9.2 Open Surfaces. The finished surface of concrete placed for such items as bridge decks, approach slabs, sidewalks and curbs shall conform to the lines, grades and elevations shown on the contract drawings and as stated herein.

5.9.2.1 Sidewalks. Sidewalk surfaces shall be laid out in blocks by use of a jointing tool, saw cutting or as indicated on the plans. Concrete edges and expansion joints shall be formed in the concrete at the designated locations. Joints shall be rounded using a 6 mm radius edging tool. Sidewalk surfaces shall be struck-off with a strike board and floated. The finished surface shall not vary more than 3 mm under a 3 m straight edge and shall be lightly broomed transversely to produce a textured, non-slip surface.

5.9.2.2 Decks. The finish deck surface shall be tight, smooth, free from ridges, depressions, undulations or blemishes. The surface shall receive a texture finish as indicated in Subsection 5.3.2 of this specification. Except across the crown, the deck surface shall be such that when tested with a 3 m long straight edge placed in any direction, there shall not be a gap greater than 8 mm between the bottom of the straight edge and the surface of the concrete.

Areas which do not meet the required surface profile shall be clearly marked and removed by the Contractor at the Contractor's expense. The Contractor shall, as directed by the Engineer:

- grind down any areas higher than 3 mm but less than 10 mm
- remove and replace deviations exceeding 10 mm. The quality of the repair shall be equal to or greater than the adjacent concrete in the undisturbed slab.

5.10 Damp-Proofing. The back face of abutments, wingwalls and retaining walls, from the top of footing to underside of curbs, as well as the top and sides of "culvert type structures", where PCC will be in contact with the earth fill, shall be damp-proofed.

Damp-proofing shall consist of one coat of emulsified asphalt diluted with clean water to a maximum of 50% by volume applied uniformly by brush or spray at the rate of 0.4 to 0.5 L/m^2 of surface area, followed, after the prime coat has cured, by one full strength coat of emulsified asphalt applied at a minimum rate of 0.5 L/m^2 of surface area.

6.0 QUALITY CONTROL / QUALITY ASSURANCE

6.1 General. Concrete shall be tested by the Department or its representative, at the point of discharge as delivered to the work site. Testing shall include but not be limited to:

- air content - CSA A23.2-4C
- slump - CSA A23.2-5C
- temperature - ASTM C1064
- compressive strength - CSA A23.2-9C

Testing by Department personnel, or representative, shall not relieve the Contractor of the overall responsibility for the strength and acceptability of the concrete supplied.

6.2 Field Adjustments. In the event that the slump and/or air content are outside the specified limit, the Contractor shall be allowed one adjustment to the concrete, conforming to the procedures outlined in CSA A23.2. If when retested, the concrete fails to meet Department Specifications, it shall be rejected unless otherwise directed by the Engineer. A minimum of two tests shall be performed on the failing property prior to concrete rejection. The Engineer shall be notified prior to any mix adjustments, however, this shall not relieve the Contractor of the responsibility to provide the specified compressive strength.

No water shall be added after the initial introduction of the mixing water for the mix, except at the start of discharge and when

- the measured slump is less than specified, and
- no more than 60 minutes[1] have elapsed after water and cement have been combined, and
- the concrete is in a stationary or truck mixer

[1] Subject to discretion of the Engineer, this time limit may be extended.

6.3 Strength Tests. For the purpose of acceptance on the basis of compressive strength, a set of cylinders shall be cast, cured and tested in accordance with the relevant specification indicated in Subsection 6.1 of this specification. The specified 28 day compressive strength is the acceptance criteria for concrete. A set of cylinders shall consist of three specimens, one specimen tested at 7 days and the remaining two tested at 28 days. The compressive strength shall be the average of the two 28 day test results.

6.4 Strength Criteria. The Department reserves the right to reject any concrete which does not meet all the requirements for the class of concrete specified.

Concrete shall be tested in accordance with CSA A23.1. The strength of each class of concrete shall be considered satisfactory if:

- the average of three consecutive strength tests equals or exceeds the specified strength, and
- no individual test is 3.5 MPa below the specified strength

6.4.1 Under Strength Concrete. Where the average of three consecutive strength tests is below the specified compressive strength, or any individual test is 3.5 MPa below the specified compressive strength, the Department may require replacement or reinforcing, at the Contractor's expense, of that portion of the structure. The Contractor may request coring to verify the insitu compressive strength of the section in question, however, such testing shall be conducted by a qualified independent testing laboratory at the Contractor's expense. A minimum of three cores shall be taken at locations determined by the Engineer. The compressive strength of all cores obtained shall be at least 85% of the specified compressive strength and no individual test result less than 75% of the specified strength. All testing shall be conducted in accordance with CSA A23.2-14C.

If the average compressive strength of the cores meets or exceeds the specified compressive strength the cost of coring by the testing laboratory shall be borne by the Department. The Contractor shall not be reimbursed for inconvenience and other associated costs of coring.

7.0 METHOD OF MEASUREMENT

7.1 General. Measurement shall be made at the contract unit price per cubic metre for Cast in Place Concrete. The quantity of concrete for payment shall be the volume in cubic metres computed from the dimensions shown on the drawings or as revised by the authority of the Engineer. No deductions shall be made for the volume of concrete displaced by steel reinforcement, joint material, structural shapes, chamfers, tops of piles, or cylindrical voids of 110 mm diameter or less.

7.1.1 Mud and Levelling Slabs. The quantity of concrete used for Mud or Leveling Slabs shall be determined by volume in cubic metres based on the delivery slip and placed in the work.

7.1.2 Curb/Gutter. The quantity of Curb/Gutter, including curb backing, shall be measured by the linear metre for the length accepted by the Engineer. No

deduction shall be made for the reduced height at driveways and other entrances.

7.1.3 Sidewalks and Driveways. The quantity of Sidewalk, Driveway and other entrances shall be measured by the square metre accepted by the Engineer and placed in the work.

8.0 BASIS OF PAYMENT

8.1 General. Except as noted herein payment will be made at the contract unit price bid per cubic metre for Cast in Place Concrete. The payment for Cast in Place Concrete shall be considered full compensation for the cost of furnishing all materials, aggregates, cement, supplementary cementing materials, water, admixtures, and other materials, non-metallic expansion joint materials, tools, equipment, falsework, forms, bracing, labour, curing, surface finish, damp-proofing and all other items of expense required to complete the concrete work as shown on the plans, and as outlined in the specifications.

Payment for roadway Curb/Gutter and Jersey Barrier will be made at the contract unit price bid per linear metre. Payment for curb backing shall be included in the unit price for Curb/Gutter. Payment for Roadway Sidewalk and Driveway entrances will be made at the contract unit price per square metre.

8.2 Payment for Cold Weather Concreting. If it is considered necessary by the Department to place concrete in cold weather, additional payment for Cold Weather Concreting will be paid. Payment shall be as detailed in the Appendix C and shall be considered payment in full for the complete protection, as outlined in this specification.

If, in the opinion of the Engineer, the placing of concrete under cold weather conditions is a result of unjustified delays, negligence, etc. on the part of the Contractor, the precautions described herein shall be followed and the cost thereof shall be borne in full by the Contractor. If the Contractor wishes to place concrete during cold weather, but if in the opinion of the Engineer, this is not required to meet the original completion date, additional payment will not be made for the Cold Weather Concreting but the precautions taken shall follow the methods outlined herein. The Contractor must receive an extension, prior to the original completion date, if the contract exceeds the original completion date, before consideration will be given to the payment of Cold Weather Concreting.

9.0 WARRANTY

SECTION 8 - PRECAST, PRESTRESSED CONCRETE GIRDERS

1.0 DESCRIPTION

This section details the manufacture, delivery, storage and erection of precast, prestressed concrete girders.

2.0 REFERENCES

All reference standards shall be current issue or latest revision at the first date of tender advertisement. This specification refers to the following standards, specifications or publications:

- ASTM C 309, Specification for Liquid Membrane-Forming Compounds for Curing Concrete
- ASTM C 260, Air-Entraining Admixtures for Concrete
- ASTM C 494, Chemical Admixtures for Concrete
- ASTM C 1064, Temperature of Freshly Mixed Portland Cement Concrete
- CAN3-G279.2, Steel Wire in Mill Coils for Prestressed Concrete Railroad Ties
- CSA A-5, Portland Cement
- CSA A23.5, Supplementary Cementing Materials
- CSA-A362, Blended Hydraulic Cement
- CSA-A23.1, Concrete Materials and Methods of Concrete Construction
- CSA-A23.2, Methods of Test for Concrete
- CSA-A23.4, Precast Concrete - Materials and Construction
- CSA-S6-88, Design of Highway Bridges
- CSA S269.3, Concrete Formwork
- Division 5 Section 7, Cast-in-Place Concrete
- PCI Manual for "Quality Control for Plants and Production of Prestressed Concrete Products

3.0 SUBMISSIONS

3.1 Shop Drawings. At least four (4) weeks prior to the proposed commencement of girder manufacture, the Contractor shall submit the shop drawings directly to the Manager of Highway & Bridge Design for review and approval. The manufacture of the girders shall not proceed until the final approval of shop drawings. Approval of the shop drawings by the Department will, not under any circumstances, relieve the Contractor of the responsibility for correctness of dimensions, size of components and the details of manufacture. The shop drawings shall include: girder details, reinforcing steel schedule, specification of prestressing strand, detensioning sequence, lifting points, as well as all hold-down details on draped or deflected strand.

3.2 Erection Procedure. At least four (4) weeks prior to the commencement of erection of girders, the Contractor shall submit to the Manager of Highway & Bridge Design details of erection procedures including lifting methods.

3.3 Concrete Mix Design. The mix design shall be submitted as per Subsection 3.4 of Division 5 Section 7 at least four weeks prior to girder manufacture. This approval will not relieve the Manufacturer of responsibility for correctness or strength requirements.

3.4 Certification. The Manufacturer of prestressed concrete girders shall be certified in accordance with CSA A23.4 prior to the time of tender. Proof of this certification shall be provided to the Manager of Highway & Bridge Design by the Contractor prior to award of the contract.

4.0 MATERIALS

4.1 Concrete. Concrete shall conform to the provision of Division 5 Section 7 of the specifications except as varied herein. The Manufacturer is responsible to provide a mix design meeting the minimum 28 day compressive strength as indicated on the drawings. The nominal maximum size of coarse aggregate shall not be larger than 20 mm and the water/cementing materials ratio shall not exceed 0.40. The air content of plastic concrete shall meet the requirements of Table 9 Category 1 of CSA A23.1. The slump shall not exceed 75 mm. If an superplasticizer is used, the slump may be increased to 230 mm provided there is no evidence of segregation.

4.2 Reinforcing Steel. Reinforcing steel shall conform to Division 5 Section 5 of the Standard Specifications. Chairs for supporting reinforcing shall be plastic or plastic tipped.

4.3 Prestressing Strand. Prestressing strand shall consist of seven wires having a centre wire and six outside wires, conforming to the latest edition of CSA G279.2. Prestressing strand shall be stabilized having a nominal diameter of 12.7 mm and ultimate tensile strength of 1860 MPa, unless otherwise specified. Prestressing strand shall be furnished either in coils, or on reels and shall be tagged to provide the following information: strand type, manufacturer, length, reel number, modulus of elasticity and ultimate strength. Each reel shall be accompanied by a stress-strain curve.

All prestressing strand must be clean and free from deleterious materials which may prevent bond between the strand and concrete. In cases where a bond break is required, the debonding material provided shall be in accordance with the approved shop drawings. Casting bed soffits shall be covered with a non-absorbent, waxed paper or an approved equivalent to prevent form release agents from contaminating the prestressing strand. Prestressing strand having kinks, nicks, bends or other defects shall not be used.

4.4 Inserts. The Manufacturer shall supply and install all inserts in the girders, as shown on the approved

shop drawings. This item shall include lifting and handling devices as well as anchors for hold-down devices.

4.5 Lifting Devices. Lifting devices for the girders shall be submitted with the shop drawings for approval by the Department.

5.0 CONSTRUCTION METHODS

5.1 The manufacture of the precast prestressed concrete girders shall be in accordance with CSA-A23.4. "Precast Concrete Materials and Construction".

5.2 Manufacturing Restriction. Between October 31 and April 1, or when the air temperature is at or below 5°C or if there is a probability of it falling below 5°C within 24 hours, girders shall be manufactured and protected in suitable enclosures or shelters.

5.3 Notification. The Contractor shall notify the Department 48 hours before any phase of the girder manufacture is commenced.

5.4 Dimension Tolerances. Girder dimensions shall meet the following tolerances:

depth (flange)	± 6 mm
depth (overall)	+ 12 mm, - 6 mm
width (overall)	+ 10 mm, - 6 mm
width (web)	+ 10 mm, - 6 mm
length	± 20 mm

Exposed Beam Deviations (from square or designated skew):

horizontal (including girder ends)	± 15 mm
vertical (including girder ends)	± 15 mm
inserts, pipe sleeves (ctr to ctr)	± 12 mm
stirrup (projection)	+ 6 mm,-20mm
reinforcing steel	± 25 mm
handling devices	± 150 mm
deflection points (anchors)	± 150 mm
ctr. of gravity of strand group	6 mm max
bearing plates (deviation from plane)	± 3 mm
bearing plates (ctr. to end of beam)	± 16 mm

5.5 Prestressing

5.5.1 Pretensioning. The prestressing strand shall be accurately held in position and stressed by jacks. If multiple strands are tensioned simultaneously, provision shall be made to include the same initial stress in each. Strands shall be tensioned to the initial tension as indicated on the approved shop drawings prior to final stressing. The variation from the specified prestress force shall not be more than 5% on the parallel strand and 7% on the draped strand. The elongation of strand shall be adjusted for the effect of temperature variations if the temperature of the steel at the time it is stressed differs by more then 15°C from the time of placement of the concrete. After three days a minimum of three strands shall be inspected. If any one shows significant movement then the remaining strands will be restressed.

One splice will be permitted per straight strand providing that no splice falls within the girder. The strand to be spliced shall have the same lay or direction of twist. If strand splices are used elongations must be adjusted to account for slippage at the splice.

Rotation of a jacking ram shall be limited to not more than one revolution per 30 m of exposed tendon. Welding of strand shall not be permitted.

5.5.2 Detensioning. Detensioning shall not proceed until the concrete in the girders has achieved the required release strength. Release cylinders shall be broken in the presence of the Department's representative. The strength shall be considered acceptable if the average of two cylinder breaks meets or exceeds the specified release strength. In single strand detensioning, the strand shall be released by heat-cutting, using a low oxygen flame or by jacking.

5.6 Concrete Placing. Concrete shall not be placed without the approval of the Department or its representative. Concrete placing methods and equipment shall be such that the concrete is conveyed and deposited at the required consistency without segregation or affecting the specified qualities of the concrete. The top surface of the girders shall be free of laitance and intentionally roughened unless specified otherwise.

5.7 Concrete Curing. Curing shall be carried out using water or steam. Side forms may be removed when the concrete strength reaches 20 MPa, however water or steam curing must continue until release strength is achieved.

5.7.1 Water Curing. Water shall be clean and free from any materials which may cause discolouration or other harmful effects to the concrete. The girders shall be maintained on the casting beds in an approved manner, designed to keep the units continuously wet and at a controlled temperature. Water curing shall be continued until the required release strength is obtained. If tarpaulins are used to enclose girders they must be clean and free from holes. Tarpaulins shall remain over the girder until release strength is obtained.

5.7.2 Steam Curing. The girders shall be maintained on the casting beds in an approved manner. The initial application of steam shall not commence until after initial set of the concrete. Steam shall not be discharged directly onto the concrete, forms or test cylinders. The ambient temperature within the enclosure shall be increased at a uniform rate not exceeding 20° C/hr. The maximum curing temperature shall not exceed 80°C. When release strength is reached, the ambient temperature shall be decreased at a maximum rate of 20°C/hr. The time-temperature relationship shall be recorded throughout the curing period.

5.8 Final Finish. Girders shall be finished as indicated

on shop drawings. Girders shall be repaired and finished in suitable enclosures or shelters where the ambient temperature is maintained above 10°C, and cured at this temperature for at least 24 hours. The sides of the girders shall be water jetted prior to sacking at a pressure which will not damage the concrete but will expose air pockets. The girder surface shall be sack rubbed finished in accordance with the latest edition of CSA-A23.1. Sacking materials can be cured with a curing compound approved by the Department.

5.9 Girder Ends. At the ends of girders which are to be cast in concrete the prestressing stand shall be burned or cut off flush with the end of the girder and the strand shall be coated with a rust protector. At the ends of girders which are not to be cast in concrete the stand shall be burned into a depth of 10 to 20 mm. All depressions left from burning shall be filled with epoxy. All slag and rough concrete shall be ground off prior to the application of two coats of asphaltic material over the entire surface of the girder ends.

5.10 Acceptance. All girders shall be inspected and accepted by the Department's representative prior to shipment.

5.11 Repairs. Repair work shall be done in accordance with CSA A23.4 and Subsections 5.11.1 and 5.11.2 of this specification. Repairs of minor defects are referred to as cosmetic repairs, while extensive defects are considered structural.

5.11.1 Cosmetic Repairs. Repairs of defects and damage to precast concrete girders shall be performed with materials in a manner that will restore the specified quality of the product.

When the defect in a girder end is less than ± 15 mm, no repair is required and the beam will be coated with the standard end coating. When the defect exceeds ± 15 mm it shall be considered a structural repair.

5.11.2 Structural Repairs. No repairs of a structural nature shall be undertaken until the Department has evaluated the damage. A defect or damage will be considered structural when:

- Main reinforcement or strand are exposed.
- Any cracking in bearing areas.
- Any cracking extending from one face of the element through to the opposite face.
- Cracks larger than 0.3 mm extending longer than 100 mm.
- Cracks larger than 0.2 mm in an area of tensile stress.

When an element is considered to have structural damage, repair procedures may include; grinding, epoxy coatings and epoxy injection. If epoxy is used it must be approved by the Department.

5.12 Identification, Handling and Storage. Girders shall be identified by stencilling or painting as indicated on approved shop drawings. In addition, each girder end shall be identified by a direction marker. No girder shall be lifted by using pickup points other than those indicated on the drawings or as approved by the Department. Girders shall be supported at a distance from the ends of the girder, not exceeding 1.5 times the depth of the member.

5.13 Transportation and Delivery. Girders shall not be shipped until the concrete has reached the specified 28 day compressive strength. Compressive strengths will be determined by obtaining the average of two test cylinders cured with the girder. Girders shall be loaded and delivered in an approved manner. Damage incurred during transportation, handling and erection shall be the responsibility of the Contractor and shall be repaired to the satisfaction of the Department.

5.14 Erection of Girders. Girders stored on site shall be supported on properly constructed blocking, until they are placed in the structure. All girders shall be erected by the Contractor in accordance with the approved erection drawing.

6.0 QUALITY CONTROL / QUALITY ASSURANCE

6.1 General. The Manufacturer is responsible to maintain accurate records of all phases of the girder manufacture.

Quality control testing shall be conducted by the Manufacturer and verified by the Department or its representative. A certificate of accuracy for scales or measuring devices shall be provided upon request. For each contract, prior to the first concrete placement, a wash sieve analysis shall be conducted on each proposed stockpiled aggregate and the results submitted to the Department or its representative. Testing shall be representative of the materials to be used in the work. Testing shall also include the determination of slump, air content, temperature, unit weight and the casting of cylinders. The frequency of concrete testing shall be at the discretion of the Department or its representative. For each days bed production, a minimum of four 28 day compressive strength cylinders shall be cast by the Manufacturer, two for the Department and two for the Manufacturer.

A minimum of two cylinders shall be cast to determine release and shipping strength for each girder produced. The release cylinders shall be cured and stored under the same conditions as the concrete in the girders.

Test specimens of the prestressing strand may be obtained from each coil and verified by the Department to determine compliance with the requirements of this specification.

The Department's representative will inspect the following phases of girder manufacture:

- prestressing operations
- installation of reinforcing steel, inserts, etc.
- aggregate testing
- concrete production, placement and curing
- detensioning operations
- finishing of girders
- dimension tolerances
- handling and storage
- transportation and delivery

The Contractor shall ensure that safe working conditions exist. The Department's representative will have the authority to stop operations if the girders do not conform to shop drawings or specifications.

7.0 METHOD OF MEASUREMENT

8.0 BASIS OF PAYMENT

8.1 General. Payment will be at the contract lump sum bid price for Precast Prestressed Concrete Girders. This price shall be full compensation for all labour, materials, plant and services necessary to manufacture, deliver and erect the girders in the final position, as shown on the shop drawings, and to the satisfaction of the Engineer.

8.2 Partial Payment. Where girders are not delivered to the job site but are delivered to a temporary storage site on property owned or leased by the Department with the prior approval of the Engineer, partial payment for the fabrication and delivery of the girders may be made, which payment will be the lesser of the Manufacturers invoice price less 15% or the tender amount less 15%. Payment will only be made at the Contractor's request.

9.0 WARRANTY

SECTION 12 - UNDERGROUND DRAINAGE SYSTEMS

1.0 DESCRIPTION

This section details the supply, installation, modification and removal of culvert and storm sewer systems.

Culvert and storm sewer systems shall include all pipe, couplings, catch basins and grates, manholes and covers and any other related material forming an integral part of the system.

2.0 REFERENCES

All reference standards shall be current issue or latest revision at the first date of tender advertisement. This specification refers to the following standards, specifications or publications:

- AASHTO M-196, Corrugated Aluminum Pipe for Sewers and Drains
- ASTM F 679, PVC Large Diameter Plastic Gravity Sewer Pipe and Fittings
- ASTM F 794, PVC Large Diameter Ribbed Gravity Sewer Pipe and Fittings
- ASTM F 949, PVC Corrugated Sewer Pipe with a Smooth Interior and Fittings
- ASTM D 3034, Type PSM, PVC Sewer Pipe and Fittings
- CSA-A257.2-M, Standards for Concrete Pipe
- CSA-B182.2, PVC Sewer Pipe and Fittings
- CSA-B182.4, Profile PVC Sewer Pipe and Fittings
- CSA-B182.6 Profile Polyethylene Sewer Pipe and Fittings
- CSA-G401-M, Corrugated Steel Pipe Products
- Division 1 Section 5, Environmental Protection
- Division 2 Section 12, Foundation Excavation
- Division 5 Section 7, Cast in Place Concrete
- Drawing HS203.DWG
- Drawing HS506.DWG
- Drawing HS528.DWG
- Occupational Health and Safety Act, Chapter 3 Part 9 Excavation
- UNI-B-5, UNI-B-6, UNI-B-9, Polyvinyl Chloride Pipe

3.0 SUBMISSIONS AND DESIGN REQUIREMENTS

3.1 Cast in Place Concrete Catch Basins. Cast in place concrete catch basins shall be designed to carry a minimum load of 38,500 kg. The design shall be completed by a Professional Engineer acceptable to the Department. Seven copies of the drawings shall be submitted to the Department for approval. No work shall commence until approval is received for the drawings.

4.0 MATERIALS

4.1 Pipe

4.1.1 Reinforced Concrete Pipe. Reinforced Concrete Pipe shall conform to CSA-A257.2-M. and shall be one of three classes: 65D, 100D or 140D as specified in the contract tender items.

4.1.2 Corrugated Steel Pipe. Corrugated Steel Pipe shall conform to CSA-G401-M, except as modified herein. The pipe shall be galvanized or aluminized Riveted Corrugated Steel Pipe or galvanized or aluminized Helical Lockseam Corrugated Steel Pipe.

The nominal wall thickness for Corrugated Steel Pipe shall be as shown in Table 5.12.1.

Table 5.12.1 - Corrugated Steel Pipe

Dia. (mm)	Wall Thickness (mm)			
	68 x 13 mm corrugation galvanized	double zinc	aluminized	125 x 26 m corrugation
300	1.6	1.6	1.6	-
400	1.6	1.6	1.6	-
500	1.6	1.6	1.6	-
600	1.6	1.6	1.6	-
800	2	2	2	-
900	2	2	2	-
1000	2	2	2	-
1200	2.8	2.8	2.8	-
1400	3.5	3.5	3.5	2.8
1600	3.5	3.5	3.5	2.8

The couplers shall be corrugated band couplers or universal dimple couplers complete with angle flanges and bolted connectors. Couplers shall be 600mm wide for all pipe sizes. If corrugated couplers are used the pipe ends shall be re-corrugated to accept the coupler.

4.1.3 Corrugated Aluminum Alloy Pipe. Corrugated Aluminum Alloy Pipe shall conform to AASHTO M-196. except as modified herein.

The nominal wall thickness for Corrugated Aluminum Alloy Pipe shall be as detailed in Table 5.12.2.

Table 5.12.2 - Corrugated Aluminum Alloy Pipe

Diameter (mm)	Wall Thickness (mm)
300	2
400	2
500	2
600	2
800	2.8
900	2.8
1000	2.8
1200	3.5

The couplers shall be corrugated band couplers or universal dimple couplers complete with angle flanges and bolted connectors. Couplers shall be 600mm wide for all pipe sizes. If corrugated couplers are used the pipe ends shall be recorrugated to accept the coupler.

4.1.4 Polyvinyl Chloride (PVC) Pipe. Polyvinyl Chloride (PVC) Pipe shall conform to CSA-B182.2, and B182.4; ASTM D 3034, F 679 and F 794 and F949; and UNI-B-5, B-6 and B-9 as appropriate.

4.1.5 High Density Polyethylene (HDPE) Pipe. High Density Polyethylene (HDPE) Pipe shall be double walled, with a smooth interior surface, conforming to CSA-B182.6. HDPE shall have a minimum stiffness of 300 KPa.

4.2 Catch Basins and Manholes. The following or equivalent types shall be considered as acceptable for use:

- Standard 760 mm dia. DOT&PW concrete catch basin (L.E. Shaw SP22) with Industrial Marine Type R361 grating
- L.E. Shaw's SP24, 1050 mm dia. precast concrete catch basin with CP-C18 top, rings as required, and Industrial Marine Type R11, S361D or S401 frame and grate
- L.E. Shaw's SP4, 1200 mm dia. precast concrete catch basin with CP-C18 top, rings as required, and Industrial Marine Type R11, S361D or S401 frame and grate
- Cast in place, block type concrete catch basin with grate designed to carry 38,500 kg (minimum).
- Lawn catch basin: 450 mm pipe, 1.25 m long with bell end up to accommodate a 6.0 mm thick plate steel grate with 25.0 mm diameter holes on a 50.0 mm grid.

Adjustments shall be carried out using the following materials:

- Precast concrete grade rings, minimum depth of 75 mm.
- Cast in place concrete to conform to Division 5 Section 7 of these specifications.
- Grout to be "M-Bed Standard", Emaco S-88", or approved equivalent and shall be mixed to the Manufacturer's specification.

5.0 CONSTRUCTION METHODS

Culvert and storm sewer system materials shall not be ordered for delivery to the site until an approved list is obtained from the Engineer.

Only culvert and storm system materials which have been selected from an approved list shall be ordered for delivery to the site.

5.1 Storm Sewer

5.11 Excavation. All trenching material shall be piled in a manner that shall not endanger the work area or obstruct sidewalk and driveways or any other area of pedestrian or vehicular traffic. Street drainage and water courses shall be maintained during construction. Hydrants under pressure, valve chamber boxes, or other utility controls shall be kept unobstructed and accessible until the work is completed.

If, at any time during the excavation, it is not possible to place material in its proper location, it shall be stockpiled in approved areas for later use. No extra payment will be considered for the stockpiling or double handling of material.

Caution shall be exercised during excavation work so that the exact location of all buried pipes, services, cables or other underground structures, both known and unknown, may be determined. The Contractor shall be responsible for the repair of such structures when broken or otherwise damaged at their own expense. The Contractor shall also, at their own expense, and in a manner approved by the Engineer, sustain in their place and protect from injury any buried pipes, services, cables, other underground structures, sidewalks, curbs, roadways, buildings and other structures or property in the vicinity of this work. The Contractor shall not be entitled to any claim or extra compensation from, or on account of, the presence of the above or on account of any delay due to the removal, realignment or rearrangement of the same.

Pumps of sufficient capacity shall be provided and kept in operation where necessary to keep the bottom of trenches dry and free from water until the pipe has been installed, inspected and backfilled as directed by

the Engineer. Disposal of such water shall not be injurious to public health or private property and shall conform to the requirements of Division 1 Section 5.

5.12 Excavation Limits. All trench excavation shall follow the alignment and grade required and shall proceed in advance of pipe laying as directed by the Engineer. All work shall be carried out in open trenches with a clear bottom width of not less than 1.0 m or as otherwise directed by the Engineer. In no case shall the width of the top of the trench be less than that shown on Plan HS528. The actual width shall be in accordance with the Occupational Health and Safety Act, Chapter 3, Part 9.

If, during excavation, the material changes from Common to Solid Rock, the Contractor shall excavate the overlying common material and notify the Engineer in order that measurements may be made. No allowance will be made for solid rock excavated before such measurements have been made.

Where the material at excavation grade is unstable, the unsuitable material shall be excavated, replaced with approved material. The material shall be compacted to 95% of Standard Proctor Density, or as directed by the Engineer. Additional excavation will be paid for as detailed in Division 2 Section 12 for actual material removed which payment shall be full compensation for backfilling and compaction of material to replace the unstable material.

If the excavation extends deeper than required, the excavation shall be refilled to the required grade with approved material and compacted to 95% of Standard Density, or as directed by the Engineer, all at the Contractor's expense.

If the excavation extends wider than the maximum limits, a deduction will be made for backfill material required outside these limits.

5.13 Sheathing and Shoring. All work done under this section shall be protected in accordance with the relevant requirements of the Occupational Health and Safety Act, Province of Nova Scotia. Where, due to soil conditions or to conform to the Occupational Health and Safety Act, the Contractor is required to use sheathing, shoring or bracing during the trench excavation, such shall be supplied, installed, maintained and removed all at the Contractor's expense. Except where otherwise directed by the Engineer, sheathing shall be withdrawn as backfilling proceeds.

5.14 Provision for Traffic and Pedestrians. During the construction of the storm sewer, warning signs, flares, delineators, barricades, etc., shall be placed and maintained at suitable intervals to protect persons from injury and to avoid property damage. These warning signs, flares, etc., shall be maintained until completion of the work.

5.15 Access to Adjacent Properties. Access to adjacent properties shall be maintained at all times during the construction period.

5.16 Laying of Pipe. Pipe for storm sewer shall be laid as shown on the contract drawings or as directed by the Engineer in accordance with these specifications.

Storm sewer pipe shall be laid to the alignment and grade set by the Engineer. Concrete pipe and polyvinyl chloride pipe shall be laid with the bells upgrade and spigot end fully entered into the adjacent bell. Where corrugated metal pipe or high density polyethylene pipe sections are to be connected, the ends shall be joined together with a coupling made of the same material and size as the pipe. Any pipe not meeting these requirements shall be removed and relaid at the Contractor's expense.

At catch basins the pipe shall be cut so that pipe ends do not project more than 300 mm inside the walls of the catch basin.

5.17 Bedding. Storm sewer pipe shall be laid on the bedding prepared and shaped to conform with the exterior bottom of the pipe. Bedding shall be as directed by the Engineer and shall conform to the requirements for Class "B" Bedding as shown on Plan HS506, Bedding Details for Laying Pipe.

Prior to placing of bedding accumulations of water and other objectionable materials shall be removed.

Bedding material shall be compacted to 95% of Standard Proctor Density or as directed by the Engineer.

5.18 Backfilling. The Contractor shall supply all labour and equipment necessary for the backfilling of all storm sewer structures and shall do all grading to reestablish excavated areas to the original ground or a specified grade.

Accumulations of water and all other objectionable material shall be removed prior to placing backfill. Granular material used as backfill material shall extend to a height of not less than 300 mm above the top of the pipe.

The backfill shall be carefully placed in layers not more

than 200 mm thick, loose depth, and compacted to 95% of Standard Proctor Density, or as directed by the Engineer.

Backfill material placed around the pipe shall be maintained at equal levels on each side of the pipe at all times so that the intended alignment of the pipe is achieved.

The Contractor shall be responsible for any damages arising from improper backfilling procedures.

5.2 Culverts. All the various classes of pipe required for drainage structures shall be furnished and delivered to the project site by the Contractor. Pipe as designated for drainage structures shall be laid on bedding prepared and shaped to conform with the exterior bottom of the pipe. Bedding for pipe culverts shall be as directed by the Engineer and shall conform to the following requirements:

- Class "A" Bedding shall consist of placing the
- culvert pipe in concrete constructed in conformity with the details as shown on plan HS506.
- Class "B" Bedding shall consist of placing the culvert pipe in 100mm layer of crushed stone or gravel constructed as shown on plan HS506.
- Class "C" Bedding shall consist of placing the culvert pipe in an earth foundation shaped and prepared as shown on plan HS506.

Concrete pipe and polyvinyl chloride pipe shall be carefully laid with the bells upgrade, spigot-end fully entered into the adjacent bell and true to established lines and grades. Polyvinyl chloride pipe shall be supplied by a plant approved by CSA. If gaskets are supplied separately for polyvinyl chloride pipe, the gaskets shall be inserted in the groove at the bell end of the pipe and the spigot shall be lubricated. The spigot end shall be inserted and pushed up to but not beyond the depth of the stop reference mark. Recesses shall be excavated for any bells involved. Where corrugated metal pipe or high density polyethylene pipe sections are required to be connected, the ends shall be connected together with a band made of the same material as the pipe. All pipe shall be laid with a uniform slope in the direction of the flow. Any pipe which is not true in alignment, or which shows any settlement after laying, shall be removed and relaid without extra compensation.

Backfill placed around pipe culverts shall be made with layers of approved material deposited on both sides of the culvert to the same elevation at the same time. All materials placed in this operation, over and around the pipe, shall be carefully placed and compacted relative to site conditions and in accordance with required compaction specifications.

5.3 Catch Basins and Manholes. Concrete catch basins including grates and manholes including covers, shall be constructed where and as directed by the Engineer.

5.4 Removals/Adjustments/Repairs

5.4.1 Removal of Concrete and Metal Pipe, Catch Basins and Manholes. Existing Concrete and Metal Pipe, Catch Basins and Manholes shall be removed where and as directed by the Engineer and shall be disposed of or salvaged if possible and shall be re-laid or stored as directed by the Engineer.

5.4.2 Removal of Driveway Culverts. Existing steel, polyethylene and concrete driveway culverts shall be removed, salvaged and either installed or stored for future use where and as directed by the Engineer. Used culverts not designated for installation shall be removed and disposed of in a manner approved by the Engineer. No driveway culverts shall be removed without an approved list from the Engineer and only the Engineer will designate which culverts are to be reused and which are to be disposed of.

5.4.3 Adjustment of Catch Basins and Manholes. The adjustment of existing catch basins and manholes shall include change in elevation of these structures .

Prior to the adjustment of catch basins and manholes the existing frame and grate or cover shall be carefully removed and salvaged. Any undesirable material used in previous adjustments shall be removed to an elevation as directed by the Engineer.

The use of metal risers, wood, concrete or clay bricks and stone shall not be allowed.

Once the catch basin or manhole has been adjusted, the salvaged frame and grate or cover shall be set on the adjusted structure.

When asphalt concrete or Portland Cement concrete pavement is required to be removed to adjust a structure, the edges of such pavement shall be neatly cut to the satisfaction of the Engineer. All construction debris resulting from adjustment shall be removed from the construction site and disposed of in accordance with Department of the Environment Regulations.

6.0 QUALITY CONTROL / QUALITY ASSURANCE

7.0 METHOD OF MEASUREMENT

7.1 Trench Measurement - Foundation Excavation Common. The quantity of Foundation Excavation

Common shall be based on average end areas calculated at maximum 10 m intervals. For payment purposes the end area at each interval shall be the product of the theoretical trench width, as determined from Plan HS528, and depth. Depth shall be determined by subtracting the theoretical bottom of excavation elevations (including bedding) from the original centerline elevations after grubbing is removed. When it is necessary to remove unsuitable material below the excavation grade, the depth at each interval shall be determined from field measurements.

7.2 Trench Measurement - Foundation Excavation Solid Rock. The quantity of Foundation Excavation Solid Rock shall be based on average end areas calculated at maximum 5 m intervals. For payment purposes the end area at each interval shall be the product of theoretical trench width, as determined from Plan HS528, and the depth. The depth at each interval shall be determined by subtracting the theoretical bottom of excavation elevations (including bedding) from the original centerline elevations taken on top of the rock.

7.3 Limit of Excavation. The limit of trench excavation shall be the point at which the excavation hole for each catch basin or manhole meets the pipe trench (a horizontal distance measured from the centerline of each catch basin or manhole).

7.4 Pipe. The quantity paid for pipe shall be the length of pipe in place measured from inlet to outlet. The lengths of coupling devices shall not be added to the length of pipe.

8.0 BASIS OF PAYMENT

8.1 Storm Sewer, Catch Basins and Manholes. Payment for laying storm sewer pipe will be at the contract unit bid price per lineal metre for Storm Sewer Pipe (of various specified diameters). Payment for installing catch basins and manholes will be at the contract unit bid prices per each for Catch Basins and Manholes (both of various specified diameters). All prices shall include all material, backfilling and compaction of approved excavation or borrow material, disposal of any surplus or unsuitable material and including all plant, equipment, labour and incidentals necessary to complete the work to the satisfaction of the Engineer.

Granular backfill and/or bedding will be paid for in accordance with the tender bid item applicable to that material.

Material excavated per this item will be paid for as either Foundation Excavation Common or Foundation Excavation Solid Rock. Boulders measuring 0.25 m^3 or over, all rock in situ and masonry or concrete of old structures shall be classified as Foundation Excavation Solid Rock, and all other excavated materials shall be classified as Foundation Excavation Common.

8.2 Culverts. Payment for laying culvert pipe will be made at the contract unit bid price per linear metre for Corrugated Aluminum Alloy Pipe, Corrugated Steel Pipe, Polyvinyl Chloride Pipe and Concrete Pipe (all of various specified diameters). This price shall be full compensation for the supply of all material, unloading, transportation charges, laying, preparation of bases, backfilling, compaction of all backfill materials, disposal of surplus materials, water control (unless noted otherwise in the Special Provisions), and also the furnishing of all equipment, tools, plant, labour and incidentals necessary to complete the work to the satisfaction of the Engineer.

Foundation excavation, non-reinforced concrete and all crushed stone or gravel shall be paid for at the contract unit bid prices for these items.

8.3 Removals/Adjustments/Repairs

8.3.1 Removal of Driveway Culverts. Removal of driveway culverts will be paid for at the contract unit bid price per lineal metre of pipe removed for Removal of Driveway Culverts which shall be full compensation for the complete removal and disposal or storage of the pipe including all equipment, plant, labour, transportation costs, excavation (see below) and incidentals necessary to complete the work to the satisfaction of the Engineer.

Where the height of cover over the top of a culvert is 2 m or less, excavation required to remove the culvert shall be included in the contract unit bid price. For culverts with more than 2 m of cover, excavation will be paid for according to Division 2 Section 12 of these specifications.

If salvaged culverts are designated for reuse immediately, the work shall be carried out and payment made according to Subsections 5.2 and 8.2 respectively.

8.3.2 Removal of Concrete and Metal Pipe, Catch Basins and Manholes. Removal of existing concrete and metal pipe will be paid for at the contract unit bid price per lineal metre for Removal of Concrete Pipe and Removal of Metal Pipe. Removal of catch basins and manholes will be paid for at the contract unit bid price per each for Removal of Catch Basins and Manholes.

All prices shall be full compensation for the complete removal, including excavation quantities and all costs associated with the disposal or salvage of material, including all equipment, plant, labour, transportation and incidentals necessary to complete the work to the satisfaction of the Engineer.

8.3.3 Adjustment of Catch Basins and Manholes. Adjustment of catch basins and manholes will be paid for at the contract unit bid price per each for Adjustment of Catch Basins and Manholes which shall be full compensation for locating the structures, neatly saw cutting the asphalt concrete or Portland cement concrete pavement surface, any removal of asphalt concrete or Portland cement concrete pavement, foundation excavation, the supply and placing of all materials used in the adjustment, backfilling with suitable material including compaction, pavement reinstatement, disposal of all construction debris and surplus material and all equipment, plant, labour, tools and incidentals necessary to complete the work to the satisfaction of the Engineer.

8.4 Additional Excavation. Additional excavation will be paid for as detailed in Division 2 Section 12 for actual material removed which payment shall be full compensation for backfilling and compaction of material to replace the unstable material.

If the excavation extends wider than the maximum limits, a deduction will be made for backfill material required outside these limits.

9.0 WARRANTY

SECTION 14 - INEXTENSIBLE MECHANICALLY STABILIZED EARTH (MSE) STRUCTURES - (WS)

1.0 DESCRIPTION

The mechanically stabilized earth (MSE) structure shall consist of a non-structural leveling pad, reinforced concrete face panels, and inextensible soil reinforcement elements mechanically connected to each facing panel. Soil reinforcement shall have sufficient strength, frictional resistance and length as required by the design, and as outlined in these specifications.

2.0 REFERENCES

All reference standards shall be current issue or latest revision at the first date of tender advertisement. This specification refers to the following standards, specification or publications:

- AASHTO Standard Specifications for Highways shall be Sixteenth Edition - 1996 and not the latest revision
- ASHTO M 111, Zinc (Hot-dip galvanized) Coating on Iron and Steel Products
- ASTM A 36/A 36M, Standard Specification for Carbon Structural Steel
- ASTM A 82, Standard Specification for Steel Wire, Plain for Concrete Reinforcement
- ASTM A 123, Standard Specification for Zinc (hot-Dip Galvanized) Coatings on Iron and Steel Products
- ASTM A 185, Standard Specification for Steel Welded Fabric, Plain, for Concrete Reinforcement
- ASTM B-663-94, Standard Specification for Silver - Tungsten Carbide Electrical Contact Material
- ASTM A 572/A 572M, Standard Specification for High-Strength Low-Alloy Columbium - Vanadium Structural Steel
- ASTM D 2240, Standard Test Method for Rubber Property - Durometer Hardness
- ASTM D 3080, Test Method for Direct Shear Test of Soils Under Consolidated Drained Conditions
- ASTM D 4355, Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water
- ASTM D 4491, Test Methods for Water Permeability of Geotextiles by Permittivity
- ASTM D 4632, Test Method for Grab Breaking Load and Elongation of Geotextiles
- CAN/CSA-S6-88, Design of Highway Bridges
- CSA-A5, Portland Cement
- CSA-A23.1, Concrete Materials and Methods of Concrete Construction
- CSA-A23.2, Methods of Test for Concrete
- CSA-A23.4, Pre-Cast Concrete Materials and Construction
- CSA-G30.12, Bullet - Steel Bars for Concrete Reinforcement
- CSA-G30.16, Weldable Low Alloy Steel Deformed Bars for Concrete Reinforcement
- CSA-G40.21-M87/M92, Structural Quality Steels
- CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles
- Division 1 Section 3, Agreement
- Division 1 Section 5, General Provisions
- Division 2 Section 13, Foundation Excavation for Bridges
- Division 3 Section 10, Fill Against Structure
- Division 5 Section 7, Cast In Place Concrete
- FHWA Publication NO. FHWA-DP.82-1 "Mechanically Stabilized Earth Walls and Reinforced Soil Slopes Design and Construction Guidelines"

3.0 SUBMISSIONS AND DESIGN REQUIREMENTS

It shall be the responsibility of the Design Engineer to provide the following information on the tender plans:

- Plan layout of MSE wall.
- Profiles.
- Developed MSE wall elevations (elevations of top and bottom of wall to be identified) and lengths of MSE walls.
- MSE wall cross-sections showing the supported structures, beam seat configuration, required finished grades, location and slope of surcharge on top of the MSE wall structure.
- Design Parameters:
  - Design Codes
  - Traffic Surcharge (kPa)
  - The magnitude and location of all loads to be carried by MSE Structure
  - Seismic Acceleration Coefficient value (a/g)
- Backfill parameters: (Default design values)
  - Internal angle of Friction for the MSE volume material (minimum 34 degrees), Backfill behind the reinforced soil zone (30 degrees)
  - Foundation Material under MSE Volume (30 degrees)
  - Unit Mass (t/m^3) for the MSE volume (19 t/m^3) Backfill behind the reinforced soil zone (19 t/m^3)
- The Allowable Bearing Capacity of the foundation soil under the MSE Volume.
- The total and differential settlement.
- All information on the stability of the foundation soils if slope stability is a concern.

Note: The service life for the MSE structure shall be 100 years.

3.1 General. The bidder shall bid one of the approved MSE structures listed in Special Provisions and shall indicate the proposed MSE structure in the bid

proposal. The system bid shall be the system built. No substitutions will be allowed. All MSE structures shall be built in accordance with the approved plans and panel shop drawings.

All appurtenances behind, in front of, under, mounted upon or passing through the MSE structure such as drainage structures, utilities, piles, footings, or other appurtenances shown on the plans shall be accounted for in the design of the MSE structure and detailed on the MSE structure supplier's drawings.

The MSE structure shall follow the general dimensions of the MSE structure envelope shown on the tender plans. The shop drawings will locate the leveling pad at or below the theoretical leveling pad elevation. The top of the face panels shall be at or above the top of the wall elevation shown on the tender plans.

For MSE Structures with plan curve radii of less than 60 metres, joint details showing panel overhang shall be submitted for the curved wall sections to the Department for review and approval.

3.2 Fabrication. The Contractor shall provide design calculations and shop drawings to the Manager of Highway & Bridge Design for review and approval within 2 weeks after the tender award. The Manufacturer of the MSE structure shall not proceed with fabrication until the final approval of the shop drawings. The drawings shall show soil reinforcement type and length; applied bearing pressures; facing panel lay-out; and representative typical details for each section of MSE structure.

3.3 Testing. It shall be the Contractor's responsibility to do the required testing and provide to the Manufacturer prior to the design of the MSE structure exact values of unit mass and angles of friction for the Fill Against Structures and the Backfill behind the reinforced soil zone. A copy of this report shall be forwarded to the Design Engineer and to the Department.

The Contractor shall furnish the Department with a Certificate of Compliance certifying that the MSE volume material meets all requirements specified by the Department. Electro - Chemical requirements and gradation requirements are to be as per Division 3, Section 10, Subsection 4.1, 4.2 and Subsection 4.6 MSE Volume Material. Aggregate tests shall be conducted by a testing laboratory approved by the Department. All test results shall accompany the Certificate of Compliance and shall be current and relevant. The Department reserves the right to carry out any additional testing as required at the Department's expense except if such testing reveals work that does not conform with the plans or specifications. In this instance the cost of the testing and the remedial work shall be at the Contractor's expense.

4.0 MATERIALS

4.1 General. Concrete shall conform to the provision of Division 5 Section 7 of the Specifications except as varied herein. The Contractor shall make their own arrangements with the MSE structure supplier to purchase the necessary premanufactured components required for the MSE structure.

4.2 Concrete Face Panels and Corner Elements. Concrete shall have a minimum compressive strength of 30 MPa at 28 days, and shall have a maximum nominal coarse aggregate size of 20 mm, the aggregates used the face panels shall be non-reactive as determined by CSA-A23.2. The maximum water to cementing materials ratio shall be 0.40. The limits for slump and percent air shall be 80 mm ± 20 mm and 6% ± 1% respectively. The minimum cementitious content shall be 320 kg. per cubic metre of concrete. Any additives including retarding agents or accelerating agents containing chlorides shall not be used.

4.3 Panel Reinforcing Steel. Reinforcing steel shall have a minimum yield strength of 400 MPa and conform to CSA G30.12. Reinforcing cages shall be fabricated with the use of steel wire ties. Tack welding of reinforcement into rigid cages requires the use of CSA-G30.16 weldable grade reinforcement, and shall be in accordance with CSA-A23.4, Subsection 4.2.

4.4 MSE Structure Components

4.4.1 Inextensible Strip Type Soil Reinforcing Systems

4.4.1.1 Reinforcing Strips. Reinforcing Strips shall consist of hot-rolled, shop fabricated ribbed structural steel conforming to CSA-G40.21 Grade 400W or better or ASTM A 572 grade 65 as shown on the Shop drawings. Galvanizing shall follow shop fabrication and shall be in accordance with CSA-G164 or ASTM A 123. Strips shall be cut to length as shown on the Shop Drawings plus or minus 500 mm.

4.4.1.2 Tie Strips. Tie strips shall consist of shop fabricated structural steel conforming to ASTM A 36 or CSA-G40.21 Grade 300W and shall be galvanized in accordance with CSA-G164 after fabrication. Bolt hole alignment, dimensions, and end distances shall be within the tolerances shown on the shop drawings.

4.4.1.3 Fasteners. ASTM A 325 bolts and nuts shall be nominal size 12.7 mm diameter hot dip galvanized.

4.4.1.4 Rubber Bearings Pads. Panels, except for the bottom coarse, shall be supported on rubber bearing pads. The rubber shall be an elastomer with a Shore Hardness of 85mm ± 5mm, as measured in accordance with ASTM D 2240.

4.4.1.5 Filter Fabric. The filter fabric shall meet the following requirements:

A non-woven geotextile with a nominal width of 500 mm shall be placed over the inside of all joints between precast panels. These strips of geotextile shall have a minimum overlap of 100 mm at any lap locations. The material shall have the following minimum average roll values:

Grab Tensile Strength	530 N
Mullen Burst	1655 kPa
Permeability	0.22cm/sec
UV Resistance	70%

These requirements for the filter fabric shall be as per ASTM D 4632, ASTM D 3786, ASTM D 4491 or ASTM D 4355 as required.

4.4.1.6 Structural Connectors. Structural plate connectors and fasteners used for yokes to connect reinforcements to wall panels around pile or utility conflicts, shall conform to the CSA Structural grades of steel and galvanizing as listed in item 4.4.1.1. Under no circumstances shall field cutting of soil reinforcement be allowed to avoid conflicts in the MSE Volume.

4.4.2 Inextensible Mesh Soil Reinforcing Systems

4.4.2.1 Reinforcing Mesh. Reinforcing mesh shall be shop fabricated of cold drawn steel wire conforming to the minimum requirements of ASTM A 82 and shall be welded into the finished mesh fabric in accordance with ASTM A 185. Bars shall be the same diameter in both directions. Galvanization shall be applied after the mesh is fabricated and shall conform to the minimum requirements of ASTM A 123.

4.4.2.2 Connection Devices. Connection Devices shall be fabricated of cold drawn steel wire conforming to the minimum requirements of ASTM A 82. Connection devices shall be welded in accordance with ASTM A 185 and galvanized in accordance with the minimum requirements of ASTM A 123.

4.4.2.3 Connector Bars. Connector Bars shall be fabricated from cold drawn steel wire conforming to ASTM A 82. Galvanization shall conform to the minimum requirements of ASTM A 123.

4.4.2.4 Joint Material. Joint Material shall be a resilient, non-extruding material; uniformly saturated with asphalt, offering a minimum 70% recovery after compression. Joint material shall conform to ASTM D 1751.

4.4.2.5 Weep Hole Covers. The weep hole covers shall have a geonet core with a minimum thickness of 6 mm. The polyethylene components shall have a minimum specific gravity of 0.93 cm^3 in accordance with ASTM D 792 and a minimum carbon black stabilization of 2% in accordance with ASTM D 4218. The geonet core shall be covered on both sides by a geotextile material. The minimum size shall be 250 mm x 250 mm.

4.4.2.6 Structural Connectors. Structural plate connectors and fastener assembles used to connect reinforcing mesh to wall panels around pile or utility conflicts shall conform to CAN/CSA-G40.21 M92 Grade 300W. Galvanization shall be applied after fabrication and shall conform to the minimum requirements of ASTM A 123.

4.5 Coping Elements. Where coping elements are required, they shall be cast as shown on the Shop Drawings and in accordance with the requirements of Division 5, Section 7 for Concrete Face Panels and Corner Elements.

4.6 MSE Volume Material. The internal angle of friction for the select backfill used in the reinforced fill zone for the internal stability design of the MSE Structure shall not be less than 34 degrees as determined by the Standard Direct Shear Test according to ASTM D 3080. The gradation limits for Fill Against Structure shall be as detailed in Division 3, Section 10 Subsection 4.2 of the Standard Specification.

ELECTRO-CHEMICAL PARAMETER	DRY STRUCTURES (above water)	FRESH WATER STRUCTURES (below water)
Chlorides (Cl^-)	< 100 ppm	< 100 ppm
Sulphates (SO_4^-)	< 500 ppm	< 500 ppm
Resistivity	> 1000 ohm-cm	> 3000 ohm-cm
pH	5 - 10	5 - 10

4.7 Drainage. For MSE Structures supporting roadways which are chemically deiced in the winter, an impervious membrane shall be placed below the pavement and just above the first row of reinforcement to intercept any flows containing deicing materials. The membrane shall be sloped to drain away from the facing to an intercepting longitudinal drain outletted beyond the reinforced zone.

5.0 CONSTRUCTION METHODS

Details of heavy equipment such as cranes or off-road trucks to be used during construction or for which the structure is to serve as temporary support, shall be reviewed by the MSE structure designer prior to construction.

After approval of the shop drawings the Contractor shall provide the Department with 24 hours notice of theintent to fabricate the panels.

The MSE structures shall be constructed in conformity with the lines, grades, details and dimensions shown on the drawings or as established by the Department. The Contractor shall make use of the guidance services provided by the supplier and provide 48 hours notice to the supplier and the Department of the intended date for start of erection.

5.1 Foundation Excavation. Excavation for the MSE structure shall be in accordance with the requirements of Division 2, Section 13 and in close conformity to the lines and grades shown on the Drawings.

5.2 Foundation Preparation. The foundation for the MSE structure shall be graded level for a width equal to the length of reinforcing strips plus approximately 500 mm or as shown on the shop drawings. Prior to wall construction, the foundation shall be proof rolled and/or compacted to the satisfaction of the Engineer. Any foundation soils found to be unsuitable shall be removed and replaced with a material as approved by the Engineer.

5.3 Leveling Pad. Concrete for the non-reinforced concrete leveling pad shall have a minimum 28 day compressive strength of 30 MPa and shall be screeded uniformly smooth with a variation of not more than 5 mm in 3 m. Elevation differences between steps shall not vary more than 5 mm from those shown on the shop drawings. The leveling pad shall be cured in accordance with CSA-A23.1 or as directed by the Engineer.

5.4 MSE Structure Erection. MSE Structure erection shall be carried out in accordance with the MSE suppliers recommendations. The Contractor shall provide the Department with a written copy of the MSE supplier's construction manual and any other site specific requirements.

5.4.1 Panel Erection Tolerances. The overall vertical tolerance and horizontal alignment tolerance of the MSE structure shall not exceed 20 mm per 3000 mm of wall. The maximum offset between adjacent panel faces shall be in accordance with the following table:

WALL RADIUS (m)	ALLOWABLE PANEL OVERHANG (mm)
∞ (Straight Wall)	10
∞ to 150	15
149 to 100	18
99 to 50	25

The fabrication tolerance for alignment of the loop wires and bolt holes of the connection insert shall not exceed 1 mm.

5.4.2 MSE Volume Material Placement. MSE Volume Material placement shall closely follow the erection of each row of panels.

The maximum MSE Volume Material lift thickness shall not exceed 250 mm (compacted). Backfill compaction shall be accomplished without disturbance or distortion of reinforcing strips and panels. MSE Volume Material compaction requirements shall be as per Division 3 Section 10 unless otherwise specified by the Engineer. For bridge abutments, particular attention shall be given to compactive effort beneath the bridge seat as outlined on the shop drawings.

Prior to installation of the bridge superstructure the MSE Volume Material placement shall be completed to a level of not less than 900 mm above the foundation level of the bridge seat unless otherwise indicated on the drawings or directed by the Engineer.

The Contractor shall not allow surface runoff from adjacent areas to enter the MSE Structure construction site.

5.4.3 Reinforcement Placement. All reinforcement placement shall be as per the appropriate construction manual for the approved MSE Structure.

5.4.4 Traffic Barrier or Coping Placement. Pre-cast or cast-in-place traffic barrier or coping, if required on top of the concrete face panels, shall have

construction/expansion joints positioned as shown on the shop drawings and shall be cast in accordance with Division 5 Section 7. Mixture design requirements shall conform to Sub-Section 4.2 of this Specification.

5.4.5 Drainage Pipe Installation. Perforated drainage pipe shall be installed within the MSE volume behind all MSE Structures. Perforated drainage pipe wrapped in filter fabric shall be installed to the lines and grades shown on the drawings and in accordance with the General Specifications or as directed by Engineer.

6.0 QUALITY CONTROL / QUALITY ASSURANCE

The Contractor shall submit to the Department a detailed Quality Control procedure for panel fabrication. This procedure is subject to Departmental approval prior to fabrication.

Upon approval of the Quality Control procedure the Department reserves the right to carry out Quality Assurance Testing as required.

7.0 METHOD OF MEASUREMENT

The preparation of all shop drawings, erection drawings, erection procedures, calculations, etc., shall not be measured for payment but shall be considered as incidental to the work. The supply of any additional materials for the MSE Structure not shown on the drawings, but deemed necessary for the erection shall not be measured for payment but shall be considered as incidental to the work.

The entire MSE Structure on a project excluding the MSE volume material and the foundation excavation shall be measured for payment as one unit for supply and erection.

The MSE volume material shall be measured in accordance with Division 3, Section 10.

Foundation Excavation shall be measured in accordance with Division 2, Section 13.

8.0 BASIS OF PAYMENT

MSE Structures will be paid for at the contract lump sum bid price for Mechanically Stabilized Earth Structures which price shall include all labour, equipment and materials required for the supply and fabrication, loading, delivery and erection of the complete MSE Structure and all other incidentals required to complete the job to the satisfaction of the Engineer. All work is to be done in accordance with the plans and the specifications.

The MSE Volume Material shall be paid for in accordance with Division 3, Section 10.

Foundation Excavation shall be paid for in accordance with Division 2, Section 13.

The cost of additional inspection and testing made necessary by the Contractor's work not meeting these specifications shall be the responsibility of the Contractor.

The Contractor may be granted partial progress payments as determined by the Engineer for this item on the basis of committed materials delivered to the Fabricator's shop and for fabrication satisfactorily completed.

The Engineer's decision as to the value of the work completed for partial progress payments shall be final. Upon payment, the material (before and after fabrication) for which payment has been made shall become the property of the Department with the Contractor assuming full responsibility for safe storage and transport to the construction site.

9.0 WARRANTY

Upon completion of the MSE Structure and visual acceptance of the work in accordance with these specifications, a one year maintenance period shall begin. During this period any failure in MSE Structure including, but not limited to, the deficiency of concrete panels and associated components; excess of tolerance on horizontal/vertical alignments; etc. shall be repaired or reconstructed at the Contractor's expense to the satisfaction of the Engineer. Costs associated with labour, materials, transportation, traffic control and any other work required for repair or reconstruction of unacceptable areas shall be paid by the Contractor.

9.1 Final Acceptance. The Department or its representative, and the Contractor will meet and inspect the MSE structure one year after the completion of the work. All areas that have failed shall be repaired at the Contractor's expense at no cost to the Department. If the Contractor and the Department do not agree on what areas are failed, the Department's decision shall be final.

The final acceptance of the original MSE structure by the Department shall relieve the Contractor from all maintenance responsibility with respect to the original MSE structure however, the Contractor shall be held responsible to maintain repaired areas for a period of

12 months after repairs are made.

9.2 Liability. During the period of construction and the one year maintenance period the Contractor shall be responsible for processing any and all claims for property damage and/or bodily injury caused by the failure of the MSE structure including, but not limited to, motor vehicles or pedestrians. The Contractor shall be responsible for the payment of all property damage and bodily injury claims and agrees to save and hold harmless the Department from all such claims as set out in Division 1 Section 4 Subsection 24 of these Specifications. Claims not handled by the Contractor or his representative efficiently or expediently will be settled by the Department and the costs recovered form the Contractor.

9.3 Warranty Holdback. Notwithstanding anything to the contrary, as stated in Division 1 Section 3 Subsection 6 of the Standard Specification, the warranty holdback for the MSE Wall will be held and retained by the Minister until the maintenance period has expired. The warranty holdback will be held to ensure that sufficient funds will be available to the Department in the event of non-performance of the MSE Structure. The Contractor is responsible for all costs including the materials and haul and for the repair of all failures and damages resulting from negligence or faulty workmanship by the Contractor that adversely affects the integrity of the MSE structure which occurs, and is evident prior to, the expiration of the one year maintenance period. The amount of warranty holdback shall be as specified in the Special Provisions.

SECTION 11 - MAGNESIUM CHLORIDE

1.0 DESCRIPTION

This section details the requirements for the supply of magnesium chloride intended for dust control and stabilization on gravel roads.

2.0 REFERENCES

All reference standards shall be current issue or latest revision at the earliest date of tender advertisement. This specification refers to the following standards, specifications or publications:

- ASTM D 1293, Test Methods for ph of Water
- ASTM D 1429, Test Methods for Specific Gravity of Water and Brine
- ASTM E 449, Test Methods for Analysis of Calcium Chloride

3.0 SUBMISSIONS AND DESIGN REQUIREMENTS

4.0 MATERIALS

4.1 Type. Magnesium chloride shall be supplied as magnesium liquid and comply with the following:

Component	Min	Max
$MgCl_2$, %	28	32
ph	4 to 6	
Specific Gravity	1.29 to 1.33	
The solution shall contain a minimum required percent by mass concentration of $MgCl_2$ as per ASTM E 449.		

4.2 Water. Water used in the solution shall be free of contaminations that could adversely affect either material performance or the environment.

4.3 Packaging and Marking. The magnesium chloride shall be delivered to the site in tank trucks for storage or applied directly by the supplier. The material shall be delivered to the specified location within 48 hours (excluding weekends) of notification. A copy of the delivery slip detailing the material and quantity (in liters) shall be provided to the Department's field representative at the time of delivery.

5.0 CONSTRUCTION METHODS

5.1 Field Application. The magnesium chloride shall be applied as directed by the Department's representative at specified locations and in a continuous manner until the work has been completed.

Material shall not be applied during periods of rain, nor if rain is expected within 12 hours of application, nor where the surface to be sprayed is in a saturated condition.

5.2 Rate of Application. Unless otherwise specified by the Department's representative, the material shall be applied in a single application at the following rates:

28 % Liquid Magnesium Chloride 1.1 to 1.2 L/m^2
32 % Liquid Magnesium Chloride 1.0 to 1.1 L/m^2

5.3 Distributor. The pressure distributor shall be capable of accurately maintaining any speed required for spraying and shall be provided with the following minimum equipment:

- A pump capable of developing a constant uniform pressure in the spray bar.
- A rear or center mounted spray bar having a positive and instant shut off, which can be set parallel to the surface. The spray bar shall be at least 2.4 m wide with the ability to add extensions to spray 3.65 m wide and shall be equipped with a pressure gauge accurate to 15 kPa.
- Spray bar nozzles, shall all be of the same manufacturer and size and shall ensure uniform fan shaped spray. Nozzles shall be set in the spray bar at angles which will allow each spray pattern to overlap the other.
- A strainer installed in the feed system to prevent clogging of the spray bar and nozzles.
- A transparent standpipe located on the tank, accurately graduated in 500 liter increments.
- An electronic spray monitor or an automatic controller system readily visible and accessible to the operator and calibrated for the material being applied.

6.0 QUALITY CONTROL / QUALITY ASSURANCE

6.1 Sampling and Testing. The Department at its discretion will take one 2 liter sample (using new containers) from the middle third of the load to determine the specific gravity. Samples that do not meet the minimum specific gravity may be tested in accordance with the Methods for Analysis of Calcium Chloride, ASTM E 449 to determine the magnesium concentration content.

6.2 Rejection. Magnesium chloride may be rejected if it fails to conform to any of the requirements of these specifications or if it is severely contaminated.

7:0 METHOD OF MEASUREMENT

The volume of magnesium chloride liquid shall be measured in liters.

8.0 BASIS OF PAYMENT

Payment for delivery of magnesium chloride shall be made at the unit price for each liter of material supplied, which price shall be full compensation for all equipment, plant, labour, associated transportation costs, pumping into storage tanks, and any incidentals required to do deliver and/or apply the magnesium chloride in the specified location(s), as specified in the tender documents.

9.0 WARRANTY

SECTION 8 - TOPSOIL

1.0 DESCRIPTION

The Contractor shall, where directed, salvage topsoil during the grubbing operation, stockpile this material (if required) and place on areas designated by the Environmental Construction Plans and/or by the Engineer.

The tendered quantity of topsoil is based on a thickness of 100 mm.

2.0 REFERENCES

All reference standards shall be current issue or latest revision at the first date of tender advertisement. This specification refers to the following standards, specifications or publications:

- Division 2 Section 3, Roadway and Drainage Excavation
- ASTM D 4972, Test Method for pH of Soil
- ASTM D 2974, Test Method for Moisture, Ash and Organic Matter of Peat and other Organic Materials

3.0 SUBMISSIONS AND DESIGN REQUIREMENTS

4.0 MATERIALS

Topsoil shall be the surface layer of soil, free draining and shall be free from subsoil, woody vegetation, stumps, roots or other debris that would prevent proper placement of the topsoil, and shall be free from stones, clay lumps or similar objects larger than 50 mm in greatest dimension. Sod and herbaceous growth such as grass and weeds need not be removed but shall be thoroughly broken up and mixed with the soil during handling operations. The material shall also be free from any material toxic to plant growth. The material shall also conform to the following pH and organic content requirements:

4.1 pH (Acidity). Topsoil, when tested in accordance with ASTM D 4972, shall have a pH between 5.5 and 7.6. When the topsoil has a pH value less than 5.5, it shall be enhanced by applying pulverized limestone at a rate necessary to attain a pH value of 6.5.

4.2 Organic Content. Topsoil, when tested in accordance with ASTM D 2974, shall have an organic content (Percentage of Dry Weight) of 2.0%. When the topsoil organic content is less than 2.0%, it shall be enhanced by adding peat or composted material at a rate necessary to attain this minimum organic content.

5.0 CONSTRUCTION METHODS

Topsoil shall be removed from construction surfaces and stockpiled when directed by the Engineer. If space within the right of way is not available for stockpiling of topsoil, the Contractor shall provide suitable areas elsewhere for the duration of the contract.

Areas where topsoil is to be placed shall be fine graded to a uniform surface, shall be free of all vegetation and other debris and free from stones which would not be covered by the specified depth of topsoil.

Topsoil shall be spread to a uniform depth of approximately 100 mm ± 25 mm on designated areas.

6.0 QUALITY CONTROL / QUALITY ASSURANCE

7.0 METHOD OF MEASUREMENT

Where topsoil is to be drawn from stockpiles built by the Contractor or from existing stockpiles designated in the contract and placed, measurement shall be made in square metres of surface covered, measured along the slope of the ground.

8.0 BASIS OF PAYMENT

Payment for topsoil will be at the contract unit price per square metre which shall be full compensation for all labour, equipment and materials (including pulverized limestone, peat, compost material) necessary to do the work.

The salvaging and stockpiling of topsoil obtained on site will not be measured for payment but shall be considered as incidental to Division 2 Section 3.

The costs incurred by the Contractor for handling, stockpiling and transporting topsoil will be considered as incidental to the work.

9.0 WARRANTY

Nova Scotia
Department of
Transportation
and Public Works

TENDER

TO THE DEPARTMENT OF TRANSPORTATION AND PUBLIC WORKS ,
HALIFAX, NOVA SCOTIA: -

The undersigned Bidder has carefully examined the site of the work described herein; has become familiar with local conditions and the character and extent of the work; has carefully examined every part of the proposed Contract and thoroughly understands its stipulations, requirements and provisions.

The undersigned Bidder has determined the quality and quantity of materials required; has investigated the location and determined the sources of supply of the materials required; has investigated labour conditions and has arranged for the continuous prosecution of the work herein described.

The undersigned Bidder hereby agrees to be bound by the award of the Contract and if awarded the Contract on this Tender to execute the required Contract within ten days after notice of award.

The undersigned Bidder further agrees to provide all necessary equipment, tools, labour, incidentals and other means of construction to do all the work, and furnish all the materials of the specified requirements which are necessary to complete the work in accordance with the Contract, and agrees to accept therefor as payment in full the unit prices for the various items described in the Specifications and set forth in the Schedule of Prices in his Tender, and to do all Extra Work which may be required in connection with the construction and completion of the work under the Contract.

The undersigned Bidder understands that the quantities of work shown herein are approximate only and are subject to increase or decrease and agrees that all quantities of work, whether increased or decreased, are to be performed at the unit prices stated in the following Estimate of Quantities and Schedule of Prices for the work described.

Description of Work.

TENDER NO.
PROJECT NO.

TENDER NO. PROJECT NO.

Specification (A)		Unit (B)	Estimated Quantity (C)	Unit Price Written Words (D)	Unit Price Figures (E)	Extension (F)
2.01.01	Clearing of Highway (Div. 2. Sec. 1)	hectare				
2.01.02	Special Clearing (Div. 2. Sec. 1)	hectare				
2.01.03	Removal of Isolated or Ornamental Trees (Div 2. Sec 1)	each				
2.01.04	Relocate Ornamental Trees or Shrubs (Div 2. Sec.1)	each				
2.02.01	Grubbing of Highway (Div. 2. Sec. 2)	hectare				
2.02.02	Special Grubbing (Div. 2. Sec. 2)	hectare				
2.03.01	Roadway & Drainage Excavation Common (Div. 2 Sec. 3)	cubic metre				
2.03.02	Swamp Excavation (Div. 2 Sec. 3)	cubic metre				
2.03.03	Solid Rock Excavation (Div. 2 Sec. 3)	cubic metre				
2.03.04	Special Excavation (Spec. Prov.)	cubic metre				
					CARRIED FORWARD $	

Note ! Column "D" to be completed in written form. Column "E" to be completed in numerical form . Column "F" to be completed in numerical form.

WHERE THERE IS A CONFLICT WRITTEN WORD WILL GOVERN

TENDER NO. PROJECT NO.

Specification (A)		Unit (B)	Estimated Quantity (C)	Unit Price Written Words (D)	Unit Price Figures (E)	Extension (F)
2.03.05	Ditching (Spec. Prov.)	metre				
2.05	Borrow (Div. 2 Sec. 5)	cubic metre				
2.08	Compaction (Div. 2 Sec. 8)	cubic metre				
2.09	Water for Compaction & Dust Control (Div. 2 Sec. 9)	kilolitre				
2.10	Rough Grading (Div. 2 Sec. 10)	square metre				
2.11	Fine Grading (Div. 2 Sec. 11)	square metre				
2.12.01	Foundation Excavation Common (Div. 2 Sec. 12)	cubic metre				
2.12.02	Foundation Excavation Solid Rock (Div. 2 Sec. 12)	cubic metre				
2.13.01	Foundation Excavation Common for Bridges (Div. 2 Sec. 13)	cubic metre				
2.13.02	Foundation Excavation Solid Rock for Bridges (Div. 2 Sec. 13)	cubic metre				
					CARRIED FORWARD $	

Note ! Column "D" to be completed in written form. Column "E" to be completed in numerical form . Column "F" to be completed in numerical form.

WHERE THERE IS A CONFLICT WRITTEN WORD WILL GOVERN

TENDER NO. PROJECT NO.

Specification (A)		Unit (B)	Estimated Quantity (C)	Unit Price Written Words (D)	Unit Price Figures (E)	Extension (F)
2.15.01	Overhaul 300m - 599 (Div.2 Sec.3)	cubic metre		FIFTY CENTS	0.50	
2.15.02	Overhaul: 600m - 899m (Div. 2 Sec. 3)	cubic metre		SIXTY-ONE CENTS	0.61	
2.15.03	Overhaul: 900m -1199m (Div. 2 Sec. 3)	cubic metre		SEVENTY-TWO CENTS	0.72	
2.15.04	Overhaul: 1200m - 1499m (Div. 2 Sec. 3)	cubic metre		ONE DOLLAR AND ONE CENTS	1.01	
2.15.05	Overhaul: 1500m - 1799m (Div. 2 Sec. 3)	cubic metre		ONE DOLLAR AND EIGHTEEN CENTS	1.18	
2.15.06	Overhaul: 1800m - 3199m (Div. 2 Sec. 3)	cubic metre		ONE DOLLAR AND FIFTY-NINE CENTS	1.59	
2.15.07	Overhaul: 3200m - 4799m (Div. 2 Sec. 3)	cubic metre		ONE DOLLAR AND NINETY-EIGHT CENTS	1.98	
2.15.08	Overhaul: 4800m - 6399m (Div. 2 Sec. 3)	cubic metre		TWO DOLLARS AND THIRTY-SEVEN CENTS	2.37	
3.01	Gravel Borrow (Div. 3 Sec. 1)	tonne				
3.02.01	Gravel Type 1S (Div. 3 Sec. 2)	tonne				
					CARRIED FORWARD $	

Note ! Column "D" to be completed in written form. Column "E" to be completed in numerical form . Column "F" to be completed in numerical form.

WHERE THERE IS A CONFLICT WRITTEN WORD WILL GOVERN

TENDER NO. PROJECT NO.

Specification (A)	Unit (B)	Estimated Quantity (C)	Unit Price Written Words (D)	Unit Price Figures (E)	Extension (F)
3.02.02 Gravel Type 1 (Div. 3 Sec. 2)	tonne				
3.02.03 Gravel Type 2 (Div. 3 Sec. 2)	tonne				
3.03.01 Iron Blast Furnace Slag Type 1S (Div. 3 Sec. 3)	tonne				
3.03.02 Iron Blast Furnace Slag Type 1 (Div. 3 Sec. 3)	tonne				
3.03.03 Iron Blast Furnace Slag Type 2 (Div. 3 Sec. 3)	tonne				
3.04.01 Clear Stone, C1 (Div. 3 Sec. 4)	tonne				
3.04.02 Clear Stone, C2 (Div. 3 Sec. 4)	tonne				
3.04.03 Clear Stone, C3 (Div. 3 Sec. 4)	tonne				
3.04.04 Clear Stone, C4 (Div. 3 Sec. 4)	tonne				
3.04.05 Clear Stone, C5 (Div. 3 Sec. 4)	tonne				
				CARRIED FORWARD $	

Note ! Column "D" to be completed in written form. Column "E" to be completed in numerical form . Column "F" to be completed in numerical form.

WHERE THERE IS A CONFLICT WRITTEN WORD WILL GOVERN

TENDER NO. PROJECT NO.

Specification (A)		Unit (B)	Estimated Quantity (C)	Unit Price Written Words (D)	Unit Price Figures (E)	Extension (F)
				BROUGHT FORWARD $		
3.06	Loose Laid Rip-Rap (Div. 3 Sec. 6)	cubic metre				
3.07	Hand Laid Rip-Rap (Div. 3 Sec.7)	cubic metre				
3.08.01	Armour Rock, R1 (Div. 3 Sec.8)	cubic metre				
3.08.02	Armour Rock, R2 (Div. 3 Sec.8)	cubic metre				
3.08.03	Armour Rock, R1 (Div. 3 Sec.8) (Spec. Prov.)	tonne				
3.08.04	Armour Rock, R2 (Div. 3 Sec.8) (Spec. Prov.)	tonne				
3.09.01	Rock Fill (Div. 3 Sec.9)	cubic metre				
3.09.02	Rock Fill (Div. 3 Sec.9) (Spec. Prov.)	tonne				
3.10.01	Fill Against Structure (Div. 3 Sec.10)	tonne				
3.10.02	Fill Against Metal Structure (Div. 3 Sec. 10)	tonne				
				CARRIED FORWARD $		

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WHERE THERE IS A CONFLICT WRITTEN WORD WILL GOVERN

TENDER NO. PROJECT NO.

	Specification (A)	Unit (B)	Estimated Quantity (C)	Unit Price Written Words (D)	Unit Price Figures (E)	Extension (F)
					BROUGHT FORWARD $	
3.11	Unshrinkable Backfill (Div. 3 Sec. 11)	cubic metre				
4.01.01	Emulsified Asphalt Tack (Div. 4 Sec. 1)	litre				
4.02	Asphalt Cement (Div. 4 Sec. 2) (Spec. Prov.)	tonne				
4.03.01	Asphalt Concrete Curbs (Div. 4 Sec. 3)	metre				
4.03.02	Asphalt Concrete Gutters (Div. 4 Sec. 3)	metre				
4.03.03	Asphalt Concrete Medians (Spec. Prov.)	metre				
4.04.01	Asphalt Concrete Type 'C' (Div. 4 Sec. 4) (Spec. Prov.)	tonne				
4.04.02	Asphalt Concrete Type 'C-HF' (Div. 4 Sec. 4) (Spec. Prov.)	tonne				
4.04.03	Asphalt Concrete Type 'B' (Div. 4 Sec. 4) (Spec. Prov.)	tonne				
					CARRIED FORWARD $	

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TENDER NO. PROJECT NO.

Specification (A)		Unit (B)	Estimated Quantity (C)	Unit Price Written Words (D)	Unit Price Figures (E)	Extension (F)
					BROUGHT FORWARD $	
4.04.04	Asphalt Concrete Type 'B-HF' (Div. 4 Sec. 4) (Spec. Prov.)	tonne				
4.04.05	Asphalt Concrete Type 'Modified C-HF' (Div. 4 Sec. 4) (Spec. Prov.)	tonne				
4.04.06	Cold In-Place Recycled Asphalt (Spec. Prov.)	square metre				
4.05	Liquid Asphalt Primer (Div. 4 Sec. 5)	litre				
4.06	Removal of Asphalt Concrete (Div. 4 Sec. 6)	square metre				
4.07	Asphalt Concrete Patching (Div. 4 Sec. 7)	tonne				
4.08	Asphalt Concrete Paving of Bridge Decks (Div. 4 Sec. 8)	tonne				
4.11	Crack Filling and Crack Sealing (EPWS) (Div. 4 Sec. 11)	linear metre				
4.12	Seal Coat (EPWS) (Div. 4 Sec. 12)	square metre				
					CARRIED FORWARD $	

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Specification (A)		Unit (B)	Estimated Quantity (C)	Unit Price Written Words (D)	Unit Price Figures (E)	Extension (F)
				BROUGHT FORWARD $		
4.13	Reclaimed Asphalt Concrete (Div. 4 Sec. 13)	square metre				
4.14	Sand Seal Surface Treatment (Div. 4 Sec. 14)	cubic metre				
4.15	Cold Mix For Winter Patching (Div. 4 Sec. 15)	tonne				
4.16	Micro-Surfacing (EPWS) (Div. 4 Sec. 16)	litre				
4.17.01	Supply & Install Geotextile For Portland Cement Concrete Pavement (Div. 4 Sec. 17) (Spec. Prov.)	square metre				
4.17.02	Granular Subbase For Portland Cement Concrete Pavement (Div. 4 Sec. 17)	tonne				
4.17.03	Portland Cement Concrete Pavement (Div. 4 Sec. 17)	square metre				
4.18	Roller Compacted Concrete Pavement (EPWS) (Div. 4 Sec. 18)	square metre				
4.19	Cold Planing (Spec Prov.)	square metre				
				CARRIED FORWARD $		

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Specification (A)		Unit (B)	Estimated Quantity (C)	Unit Price Written Words (D)	Unit Price Figures (E)	Extension (F)
				BROUGHT FORWARD $		
4.20	Pulverization (Spec. Prov.)	square metre				
5.01.01	Timber Piles (Div. 5 Sec. 1)	metre				
5.01.02	Steel Sheet Piles Delivered (Div. 5 Sec. 1)	square metre				
5.01.03	Steel H-Piles Delivered (Div. 5 Sec. 1)	metre				
5.01.04	Steel H - Piles Driven (Div. 5 Sec. 1)	metre				
5.01.05	Steel Sheet Piles Driven (Div. 5 Sec.1)	square metre				
5.01.06	Mobilization of Pile Driving Equipment (Div. 5 Sec. 1)	lump sum				
5.02.01	Timber Structures (Div. 5 Sec. 2)	cubic metre				
5.02.02	Timber Crib Work (Div. 5 Sec.2)	cubic metre				
				CARRIED FORWARD $		

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Specification (A)		Unit (B)	Estimated Quantity (C)	Unit Price Written Words (D)	Unit Price Figures (E)	Extension (F)
					BROUGHT FORWARD $	
5.03	Structural Steel (Div.5 Sec.3)	lump sum				
5.04	Miscellaneous Metal (Div.5 Sec.4)	kilogram				
5.05.01	Uncoated Reinforcing Steel Delivered (Div.5 Sec.5)	kilogram				
5.05.02	Placing of Uncoated Reinforcing Steel (Div.5 Sec.5)	kilogram				
5.05.03	Epoxy Coated Reinforcing Steel Delivered (Div. 5 Sec. 5)	kilogram				
5.05.04	Placing of Epoxy Coated Reinforcing Steel (Div.5 Sec. 5)	kilogram				
5.06.01	Erect Steel Guard Rail (Div. 5 Sec.6)	metre				
5.06.02	Erect Steel Guard Rail for Column Protection (Div. 5 Sec. 6)	metre				
5.06.03	Erect Steel Guard Rail for Bridge Approaches (Div. 5 Sec. 6)	metre				
					CARRIED FORWARD $	

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Specification (A)		Unit (B)	Estimated Quantity (C)	Unit Price Written Words (D)	Unit Price Figures (E)	Extension (F)
				BROUGHT FORWARD $		
5.06.04	Removal of Steel Guard Rail (Div. 5 Sec. 6) (Spec. Prov.)	metre				
5.06.05	Adjust Steel Guard Rail (Div. 5 Sec. 6)	metre				
5.06.06	Replace Guard Rail Sections (Div. 5 Sec.6)	metre				
5.06.07	Double Cable Guard Rail (Spec. Prov.)	metre				
5.06.08	Removal of Double Cable Guard Rail (Spec. Prov.)	metre				
5.06.09	Adjust Double Cable Guard Rail (Spec. Prov.)	metre				
5.06.10	Wooden Guide Posts in Place (Div. 5 Sec. 6)	each				
5.06.11	Removal of Wooden Guide Posts (Div. 5 Sec. 6) (Spec. Prov.)	each				
5.06.12	Adjust Wooden Guide Posts (Div. 5 Sec. 6)	each				
				CARRIED FORWARD $		

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Specification (A)		Unit (B)	Estimated Quantity (C)	Unit Price Written Words (D)	Unit Price Figures (E)	Extension (F)
				BROUGHT FORWARD $		
5.06.13	Remove & Replace Steel Guard Rail (Div. 5 Sec. 6) (Spec. Prov.)	metre				
5.07.01	Cast in Place Concrete Non-Reinforced (Div. 5 Sec. 7)	cubic metre				
5.07.02	Cast in Place Concrete Reinforced (Div. 5 Sec. 7)	cubic metre				
5.07.03	Concrete Curb and Gutter Type "A" (Div. 5 Sec. 7)	metre				
5.07.04	Concrete Curb & Gutter Type "B" (Div. 5 Sec. 7)	metre				
5.07.05	Concrete Curb & Gutter Type "C" (Div. 5 Sec. 7)	metre				
5.07.06	Concrete Curb Type "D" (Div. 5 Sec. 7)	metre				
5.07.07	Concrete Curb Type "E" (Div. 5 Sec. 7)	metre				
5.07.08	Concrete Curb Type "F" (Div. 5 Sec. 7)	metre				
5.07.09	Concrete Sidewalks (Div. 5 Sec. 7)	square metre				
				CARRIED FORWARD $		

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Specification (A)		Unit (B)	Estimated Quantity (C)	Unit Price Written Words (D)	Unit Price Figures (E)	Extension (F)
					BROUGHT FORWARD $	
5.07.10	Concrete Driveway Entrances (Div. 5 Sec. 7)	square metre				
5.07.11	Concrete Jersey Barrier (Spec. Prov.) (Div. 5 Sec. 7)	metre				
5.07.12	Cast in Place Concrete Catch Basins (Div. 5 Sec. 7)	cubic metre				
5.07.13	Concrete in Bridge Decks (Div. 5 Sec. 7)	cubic metre				
5.07.14	Cast in Place Concrete Catch Basins (Div. 5 Sec. 7)	lump sum				
5.08	Precast Prestressed Concrete Girders (Div. 5 Sec. 8)	lump sum				
5.09	Waterproofing Concrete Bridge Decks (Div.5 Sec. 9)	square metre				
5.10	Structural Plate Pipe (Spec. Prov.) (Div. 5 Sec. 10)	metre				
5.11	Aluminum Guardrail (Div. 5 Sec. 11)	metre				
					CARRIED FORWARD $	

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Specification (A)		Unit (B)	Estimated Quantity (C)	Unit Price Written Words (D)	Unit Price Figures (E)	Extension (F)
					BROUGHT FORWARD $	
5.12.01	Supply & Lay Concrete Pipe 300mm dia. Class 65D (Div. 5 Sec.12)	metre				
5.12.02	Supply & Lay Concrete Pipe 375mm dia. Class 65D (Div. 5 Sec.12)	metre				
5.12.03	Supply & Lay Concrete Pipe 450mm dia. Class 65D (Div. 5 Sec. 12)	metre				
5.12.04	Supply & Lay Concrete Pipe 600mm dia. Class 65D (Div. 5 Sec. 12)	metre				
5.12.05	Supply & Lay Concrete Pipe 750mm dia. Class 65D (Div. 5 Sec. 12)	metre				
5.12.06	Supply & Lay Concrete Pipe 900mm dia. Class 65D (Div. 5 Sec. 12)	metre				
5.12.07	Supply & Lay Concrete Pipe 1200mm dia. Class 65D (Div. 5 Sec. 12)	metre				
5.12.08	Supply & Lay Concrete Pipe 1500mm dia. Class 65D (Div. 5 Sec. 12)	metre				
5.12.09	Supply & Lay Concrete Pipe 1800mm dia. Class 65D (Div. 5 Sec. 12)	metre				
					CARRIED FORWARD $	

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Specification (A)	Unit (B)	Estimated Quantity (C)	Unit Price Written Words (D)	Unit Price Figures (E)	Extension (F)
			BROUGHT FORWARD $		
5.12.10 Supply & Lay Concrete Pipe 2100mm dia. Class 65D (Div. 5 Sec. 12)	metre				
5.12.11 Supply & Lay Concrete Pipe 300mm dia. Class 100D (Div. 5 Sec.12)	metre				
5.12.12 Supply & Lay Concrete Pipe 375mm dia. Class 100D (Div. 5 Sec. 12)	metre				
5.12.13 Supply & Lay Concrete Pipe 450mm dia. Class 100D (Div. 5 Sec. 12)	metre				
5.12.14 Supply & Lay Concrete Pipe 600mm dia. Class 100D (Div. 5 Sec. 12)	metre				
5.12.15 Supply & Lay Concrete Pipe 750mm dia. Class 100D (Div. 5 Sec. 12)	metre				
5.12.16 Supply & Lay Concrete Pipe 900mm dia. Class 100D (Div. 5 Sec. 12)	metre				
5.12.17 Supply & Lay Concrete Pipe 1200mm dia. Class 100D (Div. 5 Sec. 12)	metre				
5.12.18 Supply & Lay Concrete Pipe 1500mm dia. Class 100D (Div. 5 Sec. 12)	metre				
			CARRIED FORWARD $		

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Specification (A)	Unit (B)	Estimated Quantity (C)	Unit Price Written Words (D)	Unit Price Figures (E)	Extension (F)
				BROUGHT FORWARD $	
5.12.19 Supply & Lay Concrete Pipe 1800mm dia. Class 100D (Div. 5 Sec. 12)	metre				
5.12.20 Supply & Lay Concrete Pipe 2100mm dia. Class 100D (Div. 5 Sec. 12)	metre				
5.12.21 Supply & Lay Concrete Pipe 300mm dia. Class 140D (Div. 5 Sec.12)	metre				
5.12.22 Supply & Lay Concrete Pipe 375mm dia. Class 140D (Div. 5 Sec. 12)	metre				
5.12.23 Supply & Lay Concrete Pipe 450mm dia. Class 140D (Div. 5 Sec. 12)	metre				
5.12.24 Supply & Lay Concrete Pipe 600mm dia. Class 140D (Div. 5 Sec. 12)	metre				
5.12.25 Supply & Lay Concrete Pipe 750mm dia. Class 140D (Div. 5 Sec. 12)	metre				
5.12.26 Supply & Lay Concrete Pipe 900mm dia. Class 140D (Div. 5 Sec. 12)	metre				
5.12.27 Supply & Lay Concrete Pipe 1200mm dia. Class 140D (Div. 5 Sec. 12)	metre				
				CARRIED FORWARD $	

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Specification (A)		Unit (B)	Estimated Quantity (C)	Unit Price Written Words (D)	Unit Price Figures (E)	Extension (F)
				BROUGHT FORWARD $		
5.12.28	Supply & Lay Concrete Pipe 1500mm dia. Class 140D (Div. 5 Sec. 12)	metre				
5.12.29	Supply & Lay Concrete Pipe 1800mm dia. Class 140D (Div. 5 Sec. 12)	metre				
5.12.30	Supply & Lay Concrete Pipe 2100mm dia. Class 140D (Div. 5 Sec. 12)	metre				
5.12.31	Supply & Lay Concrete Pipe 1200mm dia. With Fish Baffles (Div. 5 Sec. 12)	metre				
5.12.32	Supply & Lay Concrete Pipe 1500mm dia. With Fish Baffles (Div. 5 Sec. 12)	metre				
5.12.33	Supply & Lay Concrete Pipe 1800mm dia. With Fish Baffles (Div. 5 Sec. 12)	metre				
5.12.34	Suply & Lay Concrete Pipe 2100mm dia. With Fish Baffles (Div. 5 Sec. 12)	metre				
5.12.35	Supply & Lay Corrugated Steel Pipe 300mm dia. (Div. 5 Sec.12)	metre				
5.12.36	Supply & Lay Corrugated Steel Pipe 400mm dia. (Div. 5 Sec. 12)	metre				
				CARRIED FORWARD $		

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Specification (A)	Unit (B)	Estimated Quantity (C)	Unit Price Written Words (D)	Unit Price Figures (E)	Extension (F)
				BROUGHT FORWARD $	
5.12.37 Supply & Lay Corrugated Steel Pipe 500mm dia. (Div. 5 Sec. 12)	metre				
5.12.38 Supply & Lay Corrugated Steel Pipe 600mm dia. (Div. 5 Sec. 12)	metre				
5.12.39 Supply & Lay Corrugated Steel Pipe 800mm dia. (Div. 5 Sec. 12)	metre				
5.12.40 Supply & Lay Corrugated Aluminum Alloy Pipe 400mm dia. (Div. 5 Sec. 12)	metre				
5.12.41 Supply & Lay Corrugated Aluminum Alloy Pipe 500mm dia. (Div. 5 Sec. 12)	metre				
5.12.42 Supply & Lay Corrugated Aluminum Alloy Pipe 600mm dia. (Div. 5 Sec. 12)	metre				
5.12.43 Supply & Lay Corrugated Aluminum Alloy Pipe 800mm dia. (Div. 5 Sec. 12)	metre				
5.12.44 Supply & Lay Plastic Pipe 100mm dia. (Div. 5 Sec. 12)	metre				
5.12.45 Supply & Lay Plastic Pipe 200mm dia. (Div. 5.Sec. 12)	metre				
				CARRIED FORWARD $	

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Specification (A)		Unit (B)	Estimated Quantity (C)	Unit Price Written Words (D)	Unit Price Figures (E)	Extension (F)
				BROUGHT FORWARD $		
5.12.46	Supply & Lay Plastic Pipe 300mm dia. (Div. 5 Sec. 12)	metre				
5.12.47	Supply & Lay Perforated Plastic Pipe 100mm dia. (Div. 5 Sec. 12)	metre				
5.12.48	Supply & Lay Perforated Plastic Pipe 200mm dia. (Div. 5 Sec. 12)	metre				
5.12.49	Removal of Driveway Culverts (Div.5 Sec.12)	metre				
5.12.50	Supply & Install 750mm dia. Precast Concrete Catch Basin (Div. 5 Sec. 12)	each				
5.12.51	Supply & Install 1050mm dia. Precast Concrete Catch Basin (Div. 5 Sec. 12)	each				
5.12.52	Supply & Install 1200mm dia. Precast Concrete Catch Basin (Div. 5 Sec. 12)	each				
5.12.53	Removal of Existing Manhole/Catch Basin (Div. 5 Sec. 12)	each				
5.12.54	Adjustment of Manholes/Catch Basins (Div. 5 Sec. 12)	each				
				CARRIED FORWARD $		

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Specification (A)		Unit (B)	Estimated Quantity (C)	Unit Price Written Words (D)	Unit Price Figures (E)	Extension (F)
				BROUGHT FORWARD $		
5.12.54	Adjustment of Manholes/Catch Basins (Div. 5 Sec. 12)	each				
5.12.55	Adjustment of Water Valves (Spec. Prov.)	each				
5.12.56	Repairs to Manholes (Div. 5 Sec.12)	each				
5.12.57	Repairs to Catch Basins (Div. 5 Sec.12)	each				
5.12.59	Repairs to Water Valves (Spec. Prov.)	each				
5.12.60	Lay Existing Metal Pipe 400mm dia. (Div. 5 Sec. 12)	metre				
5.12.61	Lay Existing Metal Pipe 500mm dia. (Div. 5 Sec. 12)	metre				
5.12.62	Lay Existing Metal Pipe 600mm dia. (Div. 5 Sec. 12)	metre				
5.12.63	Lay Aluminized Pipe 400 mm dia. (Div. 5 Sec. 12)	metre				
5.12.64	Lay Aluminized Pipe 500 mm dia. (Div. 5 Sec. 12)	metre				
				CARRIED FORWARD $		

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Specification (A)		Unit (B)	Estimated Quantity (C)	Unit Price Written Words (D)	Unit Price Figures (E)	Extension (F)
					BROUGHT FORWARD $	
5.12.66	Supply & Lay Corrugated Steel Pipe 700mm Dia. (Div. 5 Sec. 12)	metre				
5.12.67	Supply & Lay Corrugated Steel Pipe 900mm Dia. (Div. 5 Sec. 12)	metre				
5.12.68	Supply & Lay Corrugated Steel Pipe 1200mm Dia. (Div. 5 Sec. 12)	metre				
5.13.01	Asphalt Concrete Removal From Bridge Deck - Restoration (Div. 5 Sec. 13)	square metre				
5.13.02	Concrete Removal on Bridge Decks - Restoration (Div. 5 Sec. 13)	square metre				
5.13.03	Soffit Repairs - Bridge Deck Restoration (Div. 5 Sec. 13)	square metre				
5.13.04	Through Repairs - Bridge Restoration (Div. 5 Sec. 13)	square metre				
5.13.05	End Posts/Intermediate Posts (Div. 5 Sec. 13) (Spec. Prov.)	each				
					CARRIED FORWARD $	

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Specification (A)		Unit (B)	Estimated Quantity (C)	Unit Price Written Words (D)	Unit Price Figures (E)	Extension (F)
					BROUGHT FORWARD $	
5.14	Inextensible Mechanically Stabilized Earth (MSE) Structures (Div. 5 Sec. 14) (Spec. Prov.)	lump sum				
5.15	Asphaltic Plug Joints (Div.5 Sec.15)	each				
6.01	Traffic Control Persons (Div.6 Sec.1)	hour				
6.02	Flashing Light Units (Div.6 Sec.2)	hour				
6.03.01	Chain Link Fence (Div. 6 Sec. 3)	metre				
6.03.02	Chain Link Fence Gates (Div. 6 Sec. 3)	each				
6.04.01	Right-of-Way Wire Fence Type "A" (Div.6 Sec. 4)	metre				
6.04.02	Right-of-Way Wire Fence Type "B" (Div.6 Sec.4)	metre				
6.04.03	Right-of-Way Fence Steel Gates (Div.6 Sec.4)	metre				
					CARRIED FORWARD $	

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Specification (A)		Unit (B)	Estimated Quantity (C)	Unit Price Written Words (D)	Unit Price Figures (E)	Extension (F)
				BROUGHT FORWARD $		
6.05.01	Removal of Curbs (Div. 6 Sec. 5)	metre				
6.05.02	Removal of Sidewalks (Div. 6 Sec. 5)	square metre				
6.06	Supply & Application of Non-Coning Traffic Paint (Div.6 Sec.6)	line-km				
6.07	Calcium Chloride Water Solution (Div. 6 Sec. 7)	kilogram				
6.08	Calcium Chloride (Div. 6 Sec. 8)	kilogram				
6.09	Sodium Chloride (Div. 6 Sec. 9)	tonne				
6.10	Winter Sand (Div. 6 Sec. 10)	tonne				
6.11	Magnesium Chloride (Div 6 Sec 11)	litre				
7.01.01	Straw Barriers (Div. 7 Sec. 1)	metre				
				CARRIED FORWARD $		

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Specification (A)		Unit (B)	Estimated Quantity (C)	Unit Price Written Words (D)	Unit Price Figures (E)	Extension (F)
					BROUGHT FORWARD $	
7.01.03	Berm Barriers (Div. 7 Sec. 1)	metre				
7.01.04	Sand Bag Barriers (Div. 7 Sec. 1)	metre				
7.01.05	Supply & Install Straw/Hay Bales (Div. 7 Sec. 1) (Spec. Prov.)	each				
7.02.01	Straw Bale Flow Checks (Div. 7 Sec. 2)	metre				
7.02.02	Sand Bag Flow Checks (Div. 7 Sec. 2)	metre				
7.02.03	Rock Flow Checks (Div. 7 Sec. 2)	metre				
7.03	Settlement Ponds (Div. 7 Sec. 3)	cubic metre				
7.05.01	Hydroseeding Type "A" (Div. 7 Sec. 5)	square metre				
7.05.02	Hydroseeding Type "B" (Div. 7 Sec. 5)	square metre				
					CARRIED FORWARD $	

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Specification (A)		Unit (B)	Estimated Quantity (C)	Unit Price Written Words (D)	Unit Price Figures (E)	Extension (F)
				BROUGHT FORWARD $		
7.06.01	Mulching Type "A" (Div. 7 Sec. 6)	square metre				
7.06.02	Mulching Type "B" (Div. 7 Sec. 6)	square metre				
7.07.01	Jute Erosion Control Blanket (Div. 7 Sec. 7)	square metre				
7.07.02	Excelsor Erosion Control Blanket (Div. 7 Sec. 7)	square metre				
7.07.03	Straw Erosion Control Blanket (Div. 7 Sec. 7)	square metre				
7.07.04	Wood Fiber Blanket (Div. 7 Sec. 7)	square metre				
7.08	Top Soil (Div. 7 Sec. 8)	square metre				
7.09	Water Control for Bridge Foundations (Div. 7 Sec. 9)	lump sum				
7.10	Turbidity Curtains (Div. 7 Sec. 10)	metre				
				CARRIED FORWARD $		

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Specification (A)		Unit (B)	Estimated Quantity (C)	Unit Price Written Words (D)	Unit Price Figures (E)	Extension (F)
				BROUGHT FORWARD $		
7.11	Water Control at Culvert Extensions or Installations (Div. 7 Sec. 11)	lump sum				
7.12	Dewatering with Filter Bags (Div. 7 Sec. 12)	lump sum				
7.13	Sodding (Div. 7 Sec. 13)	square metre				
7.14	Lime (Div.7 Sec.14)	tonne				
				CARRIED FORWARD $		

Note ! Column "D" to be completed in written form. Column "E" to be completed in numerical form . Column "F" to be completed in numerical form.

WHERE THERE IS A CONFLICT WRITTEN WORD WILL GOVERN

Nova Scotia
Department of
Transportation
and Public Works

ACKNOWLEDGEMENT OF TENDER CONTENT FORM

List of Definition of Terms, Department of Transportation and Public Works Standard Specification dated February 1, 1997 and the attached Tenders and Special Provisions, referred to in Paragraph 10 of Agreement

dated .....

BETWEEN

.....
CONTRACTOR

and her Majesty the Queen, in the Right of Her Province of Nova Scotia as represented in this behalf by the Honourable Minister of Transportation and Public Works.

DESIGNATION	NAME	DATE
Division 1. Section 1	Definition of Terms	February 1, 2000
Division 1. Section 2	Instructions to Bidders	February 1, 2001
Division 1. Section 3	Agreement	February 1, 2001
Division 1. Section 4	General Provisions	February 1, 2002
Division 1. Section 5	Environmental Protection	February 1, 1997
Division 2. Section 1	Clearing	February 1, 1997
Division 2. Section 2	Grubbing	February 1, 2000
Division 2. Section 3	Roadway and Drainage Excavation	February 1, 2000
Division 2. Section 4	Disposal of Surplus Material	March 1, 1998
Division 2. Section 5	Borrow	February 1, 2000
Division 2. Section 6	Subgrade	March 1, 1998
Division 2. Section 7	Shoulders	February 1, 1999
Division 2. Section 8	Compaction	February 1, 2002
Division 2. Section 9	Water for Compaction & Dust Control	February 1, 1999
Division 2. Section 10	Rough Grading	February 1, 1999
Division 2. Section 11	Fine Grading	February 1, 1999
Division 2. Section 12	Foundation Excavation	February 1, 2002
Division 2. Section 13	Foundation Excavation for Bridges	March 1, 1998
Division 3. Section 1	Gravel Borrow	February 1, 1997
Division 3. Section 2	Gravel Type 1, 1S, 2 & M	February 1, 2001
Division 3. Section 3	Iron-Blast Furnace Slag	February 1, 1997
Division 3. Section 4	Clear Stone	March 1, 1998

DESIGNATION	NAME	DATE
Division 3. Section 5	Compaction of Gravels	February 1, 1997
Division 3. Section 6	Loose Laid Rip-Rap	February 1, 1997
Division 3. Section 7	Hand Laid Rip-Rap	February 1, 1997
Division 3. Section 8	Armour Rock	February 1, 1997
Division 3. Section 9	Rock Fill	February 1, 1997
Division 3. Section 10	Fill Against Structure	March 1, 1998
Division 3. Section 11	Unshrinkable Backfill	February 1, 1997
Division 4. Section 1	Emulsified Asphalt	February 1, 2002
Division 4. Section 2	Performance Graded Asphalt Binder (PGAB)	February 1, 2001
Division 4. Section 3	Asphalt Concrete Curbs & Gutters	February 1, 2002
Division 4. Section 4	Asphalt Concrete Hot Mix-Hot Placed	February 1, 2002
Division 4. Section 5	Liquid Asphalt Primer	February 1, 1997
Division 4. Section 6	Removal of Asphalt Concrete	February 1, 1997
Division 4. Section 7	Asphalt Concrete Patching	February 1, 2001
Division 4. Section 8	Asphalt Concrete Paving of Bridge Decks	February 1 1997
Division 4. Section 9	Graded Aggregate Seal (Two Courses)	Deleted 2002
Division 4. Section 10	Graded Aggregate Seal (One Course)	Deleted 2002
Division 4. Section 11	Crack Filling and Crack Sealing - (EPWS)	February 1, 1997
Division 4. Section 12	Seal Coat - (EPWS)	February 1, 2002
Division 4. Section 13	Reclaimed Asphalt Concrete	February 1, 1997
Division 4. Section 14	Sand Seal Surface Treatment	February 1, 1997
Division 4. Section 15	Cold Mix for Winter Patching	February 1, 2000
Division 4. Section 16	Micro-surfacing - (EPWS)	February 1, 2001
Division 4. Section 17	Concrete Pavement	February 1, 1997
Division 4. Section 18	Roller Compacted Concrete	March 1, 1998
Division 4. Section 19	Asphalt Concrete End Product Specification (EPS)	February 1, 2002
Division 5. Section 1	Piles	February 1, 1997
Division 5. Section 2	Timber Structures	February 1, 1997
Division 5. Section 3	Structural Steel	February 1, 1997
Division 5. Section 4	Miscellaneous Metal	February 1, 1997
Division 5. Section 5	Reinforcing Steel	March 1, 1998
Division 5. Section 6	Steel Guard Rail Systems and Wooden Guide Posts	February 1, 1997
Division 5. Section 7	Cast In Place Concrete	February 1, 2002
Division 5. Section 8	Precast, Prestressed Concete Girders	February 1, 1997
Division 5. Section 9	Waterproofing Concrete Bridge Decks	February 1, 1997
Division 5. Section 10	Structural Plate Pipe	February 1, 1997
Division 5. Section 11	Aluminum Guardrail	February 1, 1997
Division 5. Section 12	Underground Drainage Systems	February 1, 2002
Division 5. Section 13	Concrete Restoration	February 1, 2000
Division 5. Section 14	Inextensible Mechanical Stabilized Earth (MSE) Structures	February 1, 2002
Division 5. Section 15	Asphaltic Plug Joints	February 1, 2000
Division 6. Section 1	Traffic Control Persons	February 1, 1997
Division 6. Section 2	Flashing Light Units	February 1, 1997
Division 6. Section 3	Chain Link Fence	February 1, 1997

DESIGNATION	NAME	DATE
Division 6. Section 4	Right-Of-Way-Fence	February 1, 1997
Division 6. Section 5	Removal of Existing Sidewalks, Driveways and Curbs	February 1, 1997
Division 6. Section 6	Supply and Application of Non-Coning Traffic Paint	February 1, 1997
Division 6. Section 7	Calcium Chloride Water Solution	February 1, 1997
Division 6. Section 8	Calcium Chloride	February 1, 1997
Division 6. Section 9	Sodium Chloride	February 1, 1997
Division 6. Section 10	Winter Sand	February 1, 1999
Division 6. Section 11	Magnesium Chloride	February 1, 2002
Division 7. Section 1	Sediment Barriers	February 1, 1997
Division 7. Section 2	Flow Checks	February 1, 2000
Division 7. Section 3	Settlement Ponds	February 1, 2000
Division 7. Section 4	Maintenance and Sediment Control	February 1, 1997
Division 7. Section 5	Hydroseeding	February 1, 2000
Division 7. Section 6	Mulching	February 1, 1997
Division 7. Section 7	Erosion Control Blankets	February 1, 2000
Division 7. Section 8	Topsoil	February 1, 1997
Division 7. Section 9	Water Control for Bridge Foundations	February 1, 1997
Division 7. Section 10	Turbidity Curtain	February 1, 2000
Division 7. Section 11	Water Control at Culvert Extensions or Installations	February 1, 1997
Division 7. Section 12	Dewatering With Filter Bags	February 1, 1997
Division 7. Section 13	Sodding	February 1, 1997
Division 7. Section 14	Lime	February 1, 2000

The undersigned bidder hereby declares that the Special Provisions and the Province of Nova Scotia Department of Transportation and Public Works Standard Specification's dated March 1, 1998 relating to this contract and listed above have been carefully read and understood. It is mutually agreed that submission of a bid shall be considered prima facie evidence that the bidder has made such examination and is satisfied as to the conditions of the Standard Specification, Special Provisions and Contract.

IN WITNESS WHEREOF the Parties hereto have herewith caused These Presents to be signed and sealed on the day and year first above written.

SIGNED, SEALED AND DELIVERED
by the Contractor

_____ in the Presence of _____

CONTRACTOR WITNESS

Revised February 1, 2002

Nova Scotia
Department of
Transportation
and Public Works

RELEASE OF SECURITY DEPOSIT FORM
AFFIDAVIT OF PAYMENT

I, _____ of _____, in
(Contractor) (Location)

the Province of _____, make oath and say as follows:

1. That I am the _____ of _____, the
(Office Held) (Company Name)
contractor in Project Number 98- XXX between the Department of Transportation and Public Works for the Province of Nova Scotia and _____.
(Company Name)
2. That all subcontractors and suppliers who have done work for and supplied materials for Project Number 98-XXX have completed their work and supplied all materials they have agreed to supply.
3. That all subcontractors and suppliers for Project Number 98-XXX have submitted invoices for and have been paid for the work performed by and the materials supplied by them.
4. That there are no outstanding claims by subcontractors and suppliers relating to Project Number 98-XXX.

SWORN BEFORE ME AT_____
(Location)

in the County of _____

and the Province of _____

this _____**day of**_____, **A.D., 20**___.

_____ _____
(Signature of Notary Public,Commissioner of the Supreme Court of N.S., etc.) **(Contractors Signature)**

By my/our signature hereunder I/we hereby identify this as the Release of Security Deposit Form referred to in this Contract executed by me/us and bearing

dated the ..... **day of**

.....**A.D., 20**.....

.....
(Contractor Signature)

STATEMENT OF ASPHALT CEMENT - LIQUID, ASPHALT - PRIMER & EMULSIFIED ASPHALT - TACK

TO THE DEPARTMENT OF TRANSPORTATION AND PUBLIC WORKS
HALIFAX, NOVA SCOTIA

Bidder:

As a supplement to my/our Tender: **PROJECT NO. 98-XXX TENDER NO. xxxxxxx**
SECTIONS, KILOMETRES

I/We herewith submit the following statement of my/our source of asphalt cement, primer and emulsified asphalt, which will enable me/us to prosecute and complete the work satisfactorily if awarded the project.

ASPHALT CEMENT

_____ _____
(REFINERY NAME) (LOCATION)

_____ _____
PRICE QUOTATION FROM SUPPLIER SPECIFIED TIME OF COMPLETION
(Price $/Metric Tonne)

PRIMER

_____ _____
(REFINERY NAME) (LOCATION)

_____ _____
PRICE QUOTATION FROM SUPPLIER SPECIFIED TIME OF COMPLETION
(Price $/Litre)

EMULSIFIED ASPHALT - TACK

_____ _____
(SUPPLIER) (LOCATION)

Respectfully submitted,

_____

_____

(ATTACHED WRITTEN PRICE QUOTATIONS FROM SUPPLIER)

RELEASE FROM ALL LIABILITIES

.....

.....CONTRACT

KNOW ALL MEN BY THESE PRESENTS that I/we.....

.....of.....in the County of ..... doing business

under the firm name or style of..... .....

.....

for and in consideration of the sum of one dollar ($1.00) of lawful money of Canada to me/us in hand well and truly paid by Her Majesty the Queen in right of her Province of Nova Scotia at or before the ensealing and delivery of These Presents, the receipt whereof is hereby acknowledged, have released and forever discharged and by These Presents do release and forever discharge Her Majesty The Queen in right of Her Province of Nova Scotia of and from all actions, causes of action, suits, depts, forfeitures, damages, claims and demands whatsoever

in law or in equity which I/we the said.....

.....

ever had, now have, or hereafter can, shall or might have by reason of or arising out of a certain contract or agreement respecting the.....

.....

in the County of....., dated the.....

day of.....A. D., 20....., Between.....

.....of.....

in the County of....., Province of Nova Scotia and HER MAJESTY THE QUEEN, in the right of Her Province of Nova Scotia as represented in this behalf by the HONOURABLE.....MINISTER OF TRANSPORTATION AND PUBLIC WORKS of the Province of Nova Scotia, or by reason of or arising out of any breaches or breaches thereof, or by reason of or arising out of any work or labour or services performed, material supplied, or plant or machinery used in connection with the said construction by me/us,

the.....

whether under the said contract or otherwise.

IN WITNESS WHEREOF I/we, the said.....

.....have hereunto my/our hand and seal subscribed and set at the City of Halifax, the.....day of.....A. D., 20.....

Signed, Sealed and
Delivered in the
presence of,

....

Witness Contractor

Signature not to be affixed here until after fulfillment of Contract.

By my/our signature hereunder I/we hereby identify this as the Release Form referred to in this Contract executed by me/us and bearing date

the.....day of.....

A.D., 20.....

.....

Contractor.

Nova Scotia Department of
Transportation and Public Works
Halifax, N.S.

March 1, 1998

ENGINEER'S CERTIFICATE OF FINAL ESTIMATE

TO: The Honorable Minister of Transportation and Public Works of Nova Scotia

RE: Agreement made the _____ day of_____by and between the Department of Transportation and Public Works

and _____(Contractor) covering the following:

Contract:_____ _____sections in _____County.

Section 1:

Section 2:

I hereby certify that the above noted contract has been inspected on behalf of the **Engineer** and it was found that the Contractor has completed **the work** and therefore, recommend to the Minister that the final estimate be paid to _____ _____in accordance with the terms of the contract. (Contractor)

The only known recoverables are as outlined in the letter attached, dated _____, 20___ and signed by _____Project Engineer.

CERTIFICATE DATED_____, 20____

SIGNATURE_____
District Director

CC: Contractor_____

NOVA SCOTIA
DEPARTMENT OF
TRANSPORTATION
AND PUBLIC WORKS

Modification of Tender

Please be advised that the following changes are requested as per

Project Number _____

Tender Number _____

Date _____

Sect. No.	Item No.	Item Description	Quantity (from Tender Document)	Unit Price Change		Extension (Quantity x Increase/Decrease)
				Increase	Decrease	
					Total Extended Difference	

As indicated above I/we wish to change my/our tender price by the following

amount $_____
(NUMERALS)

_____
(WRITTEN WORDS)

_____
Contractors Signature

_____
Company or Contractor's Name

1.0 OVERHAUL RATES

Haul, m	$ per m^3
300 - 599	0.50
600 - 899	0.61
900 - 1199	0.72
1200 - 1499	1.01
1500 - 1799	1.18
1800 - 3199	1.59
3200 - 4799	1.98
4800 - 6399	2.37
For each increment of 1600 m, the rate increases by $0.39 per m^3.	

2.0 GRAVEL IN STOCKPILE

The Contractor is advised that the current rate of $3.02 per tonne will apply to Gravel in Stockpile as referred to in Division 3 Sections 2, 3, and 4, and Division 4 Section 4.

3.0 PILOT VEHICLE

Circumstances may arise in certain signing procedures that warrant the use of a Pilot Vehicle by the Contractor. When the use of a Pilot Vehicle is approved by the Engineer, the rate to be paid for the Pilot Vehicle including the operator and all operating costs, will be $20.50 per hour.

4.0 COLD WEATHER CONCRETE

4.1 Special Protection. $4.84 per cubic metre of concrete placed.

4.2 Special Protection with Insulation. $24.40 per cubic metre of concrete placed.

4.3 Complete Housing with Heat. $49.60 per cubic metre of concrete placed.

5.0 TRUCK RATES

5.1 Cubic Metre Kilometre Rates

Km	$/m^3$	Km	$/m^3$	Km	$/m^3$	Km	$/m^3$
1	2.13	26	5.12	51	8.21	76	11.30
2	2.35	27	5.24	52	8.33	77	11.43
3	2.54	28	5.36	53	8.46	78	11.55
4	2.72	29	5.49	54	8.58	79	11.67
5	2.89	30	5.61	55	8.70	80	11.80
6	3.04	31	5.73	56	8.83	81	11.92
7	3.18	32	5.86	57	8.95	82	12.05
8	3.31	33	5.98	58	9.08	83	12.17
9	3.43	34	6.11	59	9.20	84	12.29
10	3.55	35	6.23	60	9.32	85	12.42
11	3.65	36	6.35	61	9.45	86	12.54
12	3.75	37	6.48	62	9.57	87	12.66
13	3.85	38	6.60	63	9.69	88	12.79
14	3.94	39	6.72	64	9.82	89	12.91
15	4.02	40	6.85	65	9.94	90	13.04
16	4.10	41	6.97	66	10.07	91	13.16
17	4.17	42	7.10	67	10.19	92	13.28
18	4.24	43	7.22	68	10.31	93	13.41
19	4.31	44	7.34	69	10.44	94	13.53
20	4.37	45	7.47	70	10.56	95	13.65
21	4.50	46	7.59	71	10.68	96	13.78
22	4.62	47	7.71	72	10.81	97	13.90
23	4.74	48	7.84	73	10.93	98	14.03
24	4.87	49	7.96	74	11.06	99	14.15
25	4.99	50	8.09	75	11.18	100	14.27

ADD 12.37 CENTS PER CUBIC METRE OVER 100 KM

For trucks operating with full loads, the rates will be increased by Ten (10%) Percent for specific rock hauling operations involving quarried rock or uncrushed field stone larger than 0.03 cubic metre.

5.2 Tonne Kilometre Rates - Gravel

Km	$/Tonne	Km	$/Tonne	Km	$/Tonne	Km	$/Tonne
1	1.33	28	3.35	55	5.44	82	7.53
2	1.47	29	3.43	56	5.52	83	7.61
3	1.59	30	3.51	57	5.59	84	7.68
4	1.70	31	3.58	58	5.67	85	7.76
5	1.80	32	3.66	59	5.75	86	7.84
6	1.90	33	3.74	60	5.83	87	7.91
7	1.99	34	3.82	61	5.90	88	7.99
8	2.07	35	3.89	62	5.98	89	8.07
9	2.15	36	3.97	63	6.06	90	8.15
10	2.22	37	4.05	64	6.14	91	8.22
11	2.28	38	4.13	65	6.21	92	8.30
12	2.35	39	4.20	66	6.29	93	8.38
13	2.40	40	4.28	67	6.37	94	8.46
14	2.46	41	4.36	68	6.45	95	8.53
15	2.51	42	4.43	69	6.52	96	8.61
16	2.56	43	4.51	70	6.60	97	8.69
17	2.61	44	4.59	71	6.68	98	8.77
18	2.65	45	4.67	72	6.75	99	8.84
19	2.69	46	4.74	73	6.83	100	8.92
20	2.73	47	4.82	74	6.91		
21	2.81	48	4.90	75	6.99	+7.73 cents per Tonne over 100 km	
22	2.89	49	4.98	76	7.06		
23	2.96	50	5.05	77	7.14		
24	3.04	51	5.13	78	7.22		
25	3.12	52	5.21	79	7.30		
26	3.20	53	5.29	80	7.37		
27	3.27	54	5.36	81	7.45		

5.3 Tonne Kilometre Rates - Asphalt

Km	$/Tonne	Km	$/Tonne	Km	$/Tonne	Km	$/Tonne
1	2.36	28	4.38	55	6.47	82	8.56
2	2.50	29	4.46	56	6.55	83	8.64
3	2.62	30	4.54	57	6.63	84	8.71
4	2.73	31	4.61	58	6.70	85	8.79
5	2.84	32	4.69	59	6.78	86	8.87
6	2.93	33	4.77	60	6.86	87	8.95
7	3.02	34	4.85	61	6.94	88	9.02
8	3.10	35	4.92	62	7.01	89	9.10
9	3.18	36	5.00	63	7.09	90	9.18
10	3.25	37	5.08	64	7.17	91	9.26
11	3.31	38	5.16	65	7.24	92	9.33
12	3.38	39	5.23	66	7.32	93	9.41
13	3.44	40	5.31	67	7.40	94	9.49
14	3.49	41	5.39	68	7.48	95	9.56
15	3.54	42	5.47	69	7.55	96	9.64
16	3.59	43	5.54	70	7.63	97	9.72
17	3.64	44	5.62	71	7.71	98	9.80
18	3.68	45	5.70	72	7.79	99	9.87
19	3.72	46	5.78	73	7.86	100	9.95
20	3.76	47	5.85	74	7.94		
21	3.84	48	5.93	75	8.02	+7.73 cents per	
22	3.92	49	6.01	76	8.10	Tonne over 100	
23	4.00	50	6.08	77	8.17	km	
24	4.07	51	6.16	78	8.25		
25	4.15	52	6.24	79	8.33		
26	4.23	53	6.32	80	8.40		
27	4.31	54	6.39	81	8.48		

5.4 Hourly Rate

For all truck/trailer configurations, registered to their maximum allowable weight, payment for all work compensated on an hourly basis shall be at a rate of $15.00 per axle per hour.

6.0 TRUCK RATES - SERVICE TRUCKS

6.1 Service Truck - Including Driver

This rate to be used when other rates do not apply, i.e. partial loads, intermittent use.

Truck one (1) tonne and under - $11.48 per hour
Trucks over one (1) tonne - Minimum hourly rate: $19.26 (3 cubic metres)

6.2 Service Truck- Without Driver

Truck one (1) tonne and under - $5.50 per hour

Smoothness Testing & Remedial Measures
(Asphalt Concrete; Portland Cement Concrete)

1.0 Profilograph Surface Test: The smoothness of the finished surface (top lift) of the pavement will be determined by using a Profilograph over each designated lane. The finished surface (top lift) of the pavement shall be tested and corrected to a smoothness as specified or a price adjustment will apply. All corrections outlined in the following paragraphs shall be made by the contractor at their expense.

1.0.1 Profile Index:

The Profile Index for each lane is the cumulative profile reading, normally measured in the outer wheel path, reported in mm per 100 m section using a California type profilograph and a 5 mm blanking band.

2.0 Equipment: The smoothness profile, that is the Profile Index (PRI), will be determined using a California type profilograph. The profile is recorded full scale, vertically. The profilograph will be moved longitudinally along the pavement at a speed no greater than 5 km per hour to minimize bounce. The results of the profilograph test will be evaluated as outlined in the California Test 526 (as modified by NSTPW to metric units or as noted otherwise herein).

3.0 Price Adjustment Schedule: Price adjustments will be applied based on the square metres of the final pavement surface as outlined in Table 2 of this specification. The price adjustment may be omitted or modified from the requirements stated herein for various portions of the roadway as stated in the Special Provisions or as otherwise directed by the Engineer.

4.0 Testing: The profile will terminate 10 m from the end of each bridge deck, or from a joint between existing pavement and the new pavement. Pavement profiles will be taken at approximately the outer wheel path for every lane of traffic or as directed by the Engineer. Tapers will be excluded from testing unless otherwise directed by the Engineer.

4.0.1 Testing and Evaluation:

Profilograph testing will be scheduled to be completed within one day after completion of the surface lift of pavement (ie., within one (1) day of the completion of paving on the contract), whenever practicable. Generally, the outer wheel path for each lane (or as directed by the Engineer) will be tested in 100 m sections on the surface course using the Profilograph.

4.0.2 Retesting

Method Specification: The Contractor may request (once only) the retesting of 100 m section(s) and the Department will arrange for the retesting. If the retesting determines the PRI or "deviations" are equal to or greater than the original the Contractor will pay all costs associated with retesting. If the retesting determines the PRI or "deviations" are less than the original the Department will pay all costs associated with retesting.

End Product Specification: The Department may request (once only) the retesting of 100 m section(s) and the Contractor will arrange for the retesting. If the retesting determines the PRI or "deviations" are greater than the original the Contractor will pay all costs associated with retesting. If the retesting determines the PRI or "deviations" are equal to or less than the original the Department will pay all costs associated with retesting.

All profilograph graphical printouts (tapes) will be printed in duplicate and signed off (initialized) by the Project Engineer at the time of testing. One printout shall be provided to the Project Engineer at the time of testing.

5.0 Corrective Action:

5.0.1 "Deviations" Greater Than 8 mm in 7.6 m.

Within each 100 m section, all individual "deviations" greater than 8 mm in 7.6 m as measured by the Profilograph in the final surface lift of asphalt concrete may be corrected to reduce the "deviation" or the Contractor may elect to accept a penalty as per Table 1. The "deviations" are automatically labelled by the Profilograph.

5.0.2 Testing Corrections to "Deviations" Greater Than 8 mm in 7.6 m.

On those sections where corrections are made, the pavement will be tested to determine the "deviations". Any "deviations" greater than 8 mm in 7.6 m may be corrected to reduce the "deviation" or the Contractor may elect to accept a penalty as per Table 1.

TABLE 1
"DEVIATIONS" GREATER THAN 8 mm in 7.6 m.

"DEVIATION", mm	PRICE ADJUSTMENT
8 - 9	- $500
9.1 - 10	- $700
10.1 - 11	- $900
11.1 - 12	- $1100
12.1 - 13	- $1300
13.1 - 14	- $1550
14.1 - 15	- $1850
15.1 - 16	- $2200
16.1 - 17	- $2600
17.1 - 18	- $3050
EACH ADDITIONAL 1 mm INCREMENT ABOVE 18	NO. OF INCREMENTS x -$1000 + (-$3050)

5.0.3 Initial PRI Greater Than 12 mm per 100 m

Any 100 m section having an initial PRI greater than 12 mm per 100 m may be corrected to reduce the PRI or the Contractor may elect to accept an adjusted price as outlined in the Price Adjustment Schedule in Table 2

5.0.4 Testing Corrections to PRI

On those sections where corrections are made, the pavement will be tested to determine the final PRI. Any 100 m section still having a PRI greater than 12 mm per 100 m shall be subjected to price adjustments as outlined in Table 2

5.0.5 Corrections

All corrections shall be made at the Contractor's expense.

5.0.6 Retesting of Repairs

All retesting of repairs, shall be made with the same Profilograph used to perform the original testing, and shall be performed at the Contractor's expense.

5.0.7 Portland Cement Concrete Pavement

Where corrections are required, they shall be made using an approved profiling device or by removing and replacing the pavement as approved by the Engineer. Bush hammers or other impact devices will not be permitted.

Where corrections are made, the Contractor shall re-establish the surface texture to provide a uniform texture equal in roughness to the surrounding uncorrected pavement.

5.0.8 Asphalt Concrete Pavement

Should the Contractor elect to repair any final lift of newly placed asphalt concrete pavement surface which does not meet the longitudinal smoothness requirements given above, it may be repaired by the Contractor to meet the requirements either by (a) rolling (b) cold milling and replacing, (c) overlaying or (d) removing and replacing, as approved by the Engineer, in accordance with the following:

5.0.8.1 Rolling

Corrections by rolling will only be permitted to correct deviations in transverse joints or deviations greater than 6 mm in 3 m as measured by a straightedge. Prior to rolling to correct these deviations, external heating may be used if approved by the Engineer. Raking after heating shall not be permitted.

5.0.8.2 Cold Milling and Replacing

Individual high or low areas with deviations greater than 8 mm in 7.6 m., as determined by measurements of the Profilograph in accordance with Test Method No. Calif. 526 (as modified by NSTPW) shall be reduced by cold milling the lift to its full depth and lane width.

The asphalt concrete shall be replaced to its original thickness with an approved asphalt concrete mix as per the specifications for surface course mix in the contract.

Material removed by cold milling shall become the property of the Contractor. The material shall be hauled and stockpiled in accordance with Environment Regulations. All costs associated with the hauling and stockpiling of this material and other costs incidental to the work shall be borne by the Contractor.

5.0.8.2.1 Area of Repair

When cold milling and replacing, the area of repair shall be the full width of the lane in which the repair work is being performed including the paved shoulder.

Should the Contractor opt to repair, the area of repair shall extend at least to the limits of the original repaired area.

5.0.8.3 Overlaying

The lift shall extend for the full width of the underlying pavement surface and have a finished compacted thickness sufficient to correct the roughness and produce a final surface meeting specifications. The overlay lift shall conform to the specifications of this contract for the

surface course mix. The minimum spread rate shall be 100 kg/m^2.

When overlaying is carried out on asphalt concrete pavement, keys shall be constructed at both ends of the repaired area as per specification to avoid a feather joint.

A second overlay will not be allowed if the overlay does not meet the longitudinal smoothness requirement. An overlay with a PRI greater than the initial PRI shall be repaired by the Contractor in accordance with 5.0.8.2 Cold Milling and Replacing or 5.0.8.4 Removing and Replacing. The Contractor may elect to accept an adjusted price as outlined in the Price Adjustment Schedule in Table 2 if the overlay PRI is greater than 12 mm per 100 m but less than the initial PRI.

5.0.8.3.1 Area of Repair

When overlaying, the area of repair shall be the full width of the paved surface including shoulders.

Should the Contractor opt to repair, the area of repair shall extend at least to the limits of the original repaired area.

5.0.8.4 Removing and Replacing

When the repair of pavements not meeting the smoothness criteria is made by means of removing and replacing material, the lift shall be removed to its full depth and lane width.

The asphalt concrete shall be replaced to its original thickness and shall conform to the contract specifications for a surface course mix.

The material removed by this operation shall become the property of the Contractor. The material shall be hauled and stockpiled in accordance with Environment Regulations. All costs associated with the hauling and stockpiling of this material and any other costs incidental to the work shall be borne by the Contractor.

All 'removing and replacing' areas shall be neat and of uniform surface appearance and conform to the contract specifications.

5.0.8.4.1 Area of Repair

When removing and replacing, the area of repair shall be the full width of the lane in which the repair work is being performed including the paved shoulder.

Should the Contractor opt to repair, the area of repair shall extend at least to the limits of the original repaired area.

5.0.9 Time Limits for Corrective Work:

Corrections are to be done within ten (10) calendar days of completion of the paving/repaving or the penalties will be assessed as noted in Tables 1 and Table 2.

Repairs conducted after the contract completion date are subject to the requirements of the Late Completion Clause stipulated in the Contract Special Provisions.

5.0.10 Costs to be Borne by Contractor:

All costs associated with corrective actions and/or repairs shall be borne by the Contractor, including but not limited to, such items as cold milling, overlaying, removing and disposal, and replacing. The Contractor shall supply all plant, labour, equipment, materials, traffic control and incidentals required to complete the work to the satisfaction of the Engineer.

TABLE 2
Price Adjustment Schedule

PROFILE INDEX PRI (MM/100M)	PRICE ADJUSTMENT, $ PER SQUARE METRE
≤4.0	$0.338
4.1 - 5.5 incl.	$0.270
5.6 - 7.0	$0.203
7.1 - 8.5	$0.135
8.6 - 10.0	$0.068
10.1 - 12.0	$0.000
12.1 - 15.0	- $0.270
15.1 - 18.0	- $0.540
18.1 - 21.0	- $0.810
21.1 - 22.5	- $1.080
22.6 - 24.0	- $1.350
24.1 - 25.5	- $1.620
25.6 - 27.0	- $1.890
27.1 - 28.5	- $2.160
28.6 - 30.0	- $2.430
EACH ADDITIONAL 1.4 mm INCREMENT ABOVE 30.0	NO. OF INCREMENTS x -$1.270 +(-$2.430)